ALL-PURPOSE" TRANSMITTER-RECEIVER

RADIO NEWS

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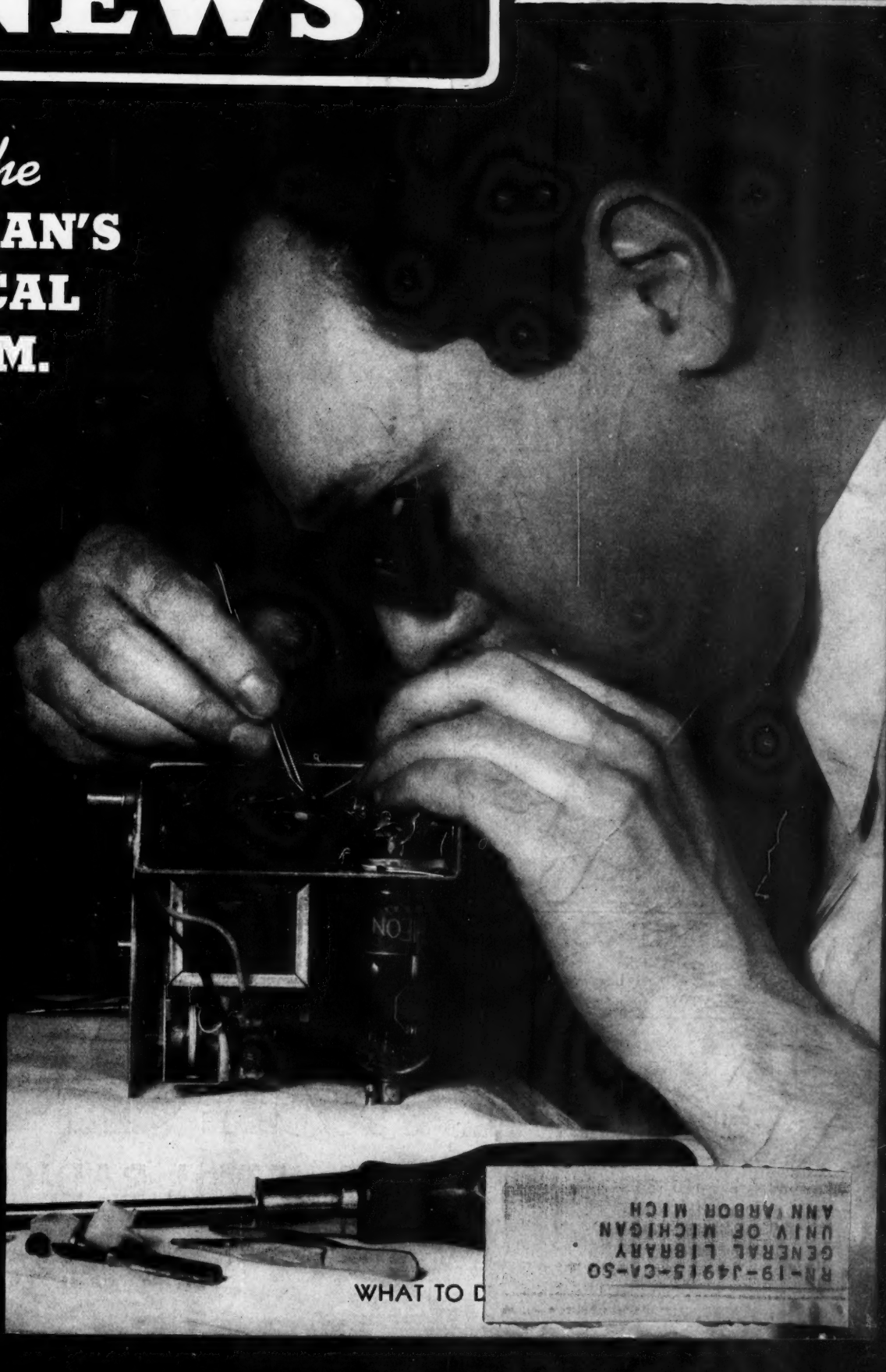

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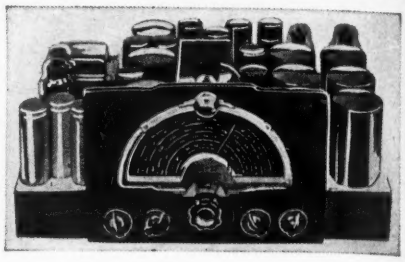
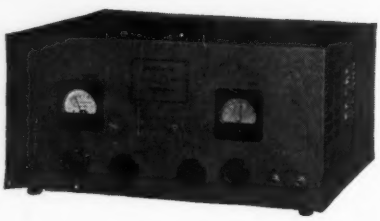
DAVEGA—63 CORTLANDT ST. (N.Y.C.)



DAVEGA is America's Pioneer dealer in HALLICRAFTER

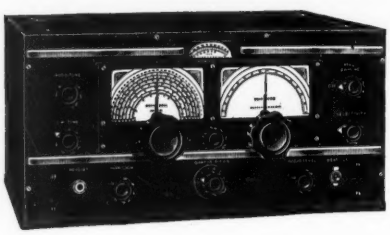


New Hallicrafter H-T-6 transmitter. Frequency range 1.7 to 60 M.C. Can operate on 12-32-110 Volts. Band switching, special oscillator keying provision. 25 watts phone and CW.

NEW HALLICRAFTERS SKYRIDER SX 23: A new 11 Tube Receiver with 8 Band Positions, with full coverage from 34 to .54 MC (8.8 to 556 meters), Band Spread Positions for 10, 20, 40 and 80 meter bands, Drift Compensation, Automatic Noise Limiter, Wide Range Variable Selectivity, new, indirectly illuminated Venetian Blind type Tuning Dial and "S" meter.

Davega has the largest stock of Hallicrafter Receivers and Transmitters in America

DAVEGA has the most complete Stock of RME in America



RME-70. The late development of RME laboratories is proving itself to be one of the finest communications receivers.

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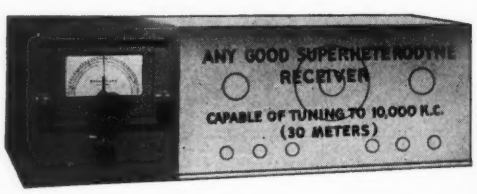

The DM-36. RME engineers again come through with a fine unit. This unit, in conjunction with a good medium frequency superheterodyne receiver provides the equivalent of low-frequency reception on 5 and 10 meters. The DM-36 is ready for your inspection at Davega.

DB-20 by RME. Signal amplifier, image rejector, guaranteed to improve any set enormously or your money refunded.

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Single signal 16-tube Superheterodyne circuit. Two tuned r.f. stages, constant percentage electrical band speed, individual isolated oscillators, two I.F. amplifier stages, crystal filter, push-pull power output stage and an integral power supply.

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Why Many Radio Experts Make $30, $50, $75 a Week

Radio is young—yet it's one of our large industries. More than 28,000,000 homes have one or more Radios. There are more Radios than telephones. Every year millions of Radios get out of date and are replaced. Millions more need new tubes, repairs. Over $50,000,000 are spent every year for Radio repairs alone. Over 5,000,000 auto Radios are in use; more are being sold every day, offering more profit-making opportunities for Radio experts. And RADIO IS STILL YOUNG, GROWING, expanding into new fields. The few hundred $30, $50, $75 a week jobs of 20 years ago have grown to thousands. Yes, Radio offers opportunities—now and for the future!

Get Ready Now for Your Own Radio Business and for Jobs Like These

Radio broadcasting stations employ engineers, operators, station managers and pay well for trained men. Fixing Radio sets in spare time pays many $200 to $500 a year—full time jobs with Radio jobbers, manufacturers and dealers as much as $30, $50, $75 a week. Many Radio Experts open full or part time Radio sales and repair businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, in good-pay jobs with opportunities for advancement. Automobile, police, aviation, commercial Radio, loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I trained have good jobs in these branches of Radio. Read how they got their jobs. Mail coupon.

HERE ARE A FEW EXAMPLES OF THE KIND OF MONEY I TRAIN MY MEN TO MAKE

$200 TO $300 A MONTH IN OWN BUSINESS

"For the last 18 months I have been in business for myself, making between $200 and $300 a month. I have N.R.I. to thank for my start in this field."—ARLIE J. FROEHNER, 224 W. Texas Ave., Goose Creek, Texas.

$10 TO $25 A WEEK IN SPARE TIME

"I am making from $10 to $25 a week in spare time while still holding my regular job as a machinist. I owe my success to N. R. I."—WM. F. RUPP, 203 W. Front St., West Conshohocken, Pa.

CHIEF OPERATOR BROADCASTING STATION

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"I have been doing nicely, thanks to N.R.I. Training. My present earnings are about three times what they were before I took the Course. I consider N.R.I. Training the finest in the world."—BERNARD COSTA, 952 Manhattan Ave., Brooklyn, N. Y.

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"Before completing half the N.R.I. Course I was servicing sets, and I made $1,000 to $1,200 before graduating. I am doing Radio service work for myself now."—ASHLEY G. ALDRIDGE, 1228 Shepherd St., Petersburg, Va.

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I want to prove my Training gives practical, money-making information, that it is easy to understand—what you need to master Radio. My sample lesson text, "Radio Receiver Troubles—Their Cause and Remedy," covers a long list of Radio receiver troubles in A.C., D.C., battery, universal, auto, T. R. F., superheterodyne, all-wave, and other types of sets. And a cross reference system gives you the probable cause and a quick way to locate and remedy these set troubles. A special section is devoted to receiver check-up, alignment, balancing, neutralizing, testing. You can get this lesson Free by mailing the coupon.

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I ALSO GIVE YOU THIS PROFESSIONAL SERVICING INSTRUMENT

Here is the instrument every Radio expert needs and wants — an All-Wave, All-Purpose, Set Servicing Instrument. It contains everything necessary to measure A.C. and D.C. voltages and current; to test tubes, resistance; adjust and align any set, old or new. It satisfies your needs for professional servicing after you graduate—can help you make extra money fixing sets while training.

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- ☐ Spare Time Radio Repair Work
- ☐ Retail Sales of Radio Sets and Equipment
- ☐ Service Expert for Retail Stores
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- ☐ Auto Radio Installation and Service
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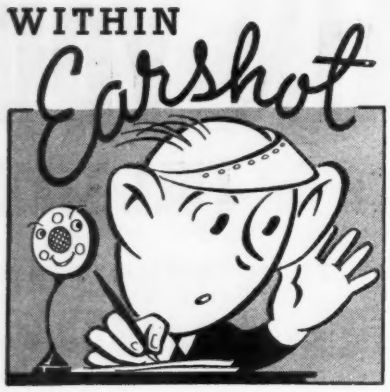

OF THE EDITOR

BY the time that this reaches your hands, summer will be upon us. With it will come lazy days and dreamy evenings. It is hard to keep your face near the hot soldering iron when Mother Nature puts on her annual show. But those of us who are in on the know will realize that during these months, many a draftsman's board will be creaking with the weight of future plans, and many an engineer's bench will be burdened down with laboratory models of coming radio units. For it is during this period that the Industry plans for the coming fall season and the winter. Summer is far from being the idle period that many suppose, instead it is a time of feverish activity,—not of production of the factory,—but of production of the mind. Many of our best radiomen are deep in the problems of the ensuing year.

It is our guess that with 1940 will come an increase of utilitarian uses for radio. We now have our "mystic" phonographs, and our "remote magic" tuners. We shall see other uses for the Hertzian wave. Control of floods, factory units, airplanes, and ships are just some of these uses that come to our mind. Watch the next season, it will see Radio grow from a *Communication* to a *Servant of Mankind!*

* * *

AT the Board of Directors Meeting of the A.R.R.L. held in San Francisco this last May, some far-reaching innovations were enacted. We are happy to report that many of the new propositions were advocated by R.N. in the recent column "The National QSO Page." It would seem that at last the Directorate of the A.R.R.L. has been awakened by the membership. With the initial forward strides the Directors have made, we feel more than compensated for the space we devoted to the furthering of the great American Institution—Ham Radio. It is now up to the members themselves to keep up the good work.

* * *

A BONE of contention has arisen among the jobbers and the manufacturers as to what is a "jobber." It seems that almost any Tom, Dick or Harry is in the habit of terming himself a "jobber" just to get discounts

(*More Earshot on page* 44)

RADIO NEWS

Including Articles on POPULAR TELEVISION

The Magazine for the radio amateur experimenter, serviceman & dealer

VOL. 22, NO. 1

Contents for July, 1939

FEATURES

DEPARTMENTS

RADIO NEWS is published monthly by the Ziff-Davis Publishing Company at 608 S. Dearborn St., Chicago, Ill. William B. Ziff, Publisher; B. G. Davis, Editor; Karl A. Kopetzky, Managing Editor; Oliver Read, Technical Editor, E. Stanton Brown, Associate Editor; Herman R. Bollin, Art Director; John H. Reardon, Circulation Director; S. L. Cahn, Advertising Manager. New York Office, 381 Fourth Ave. Subscription $1.50 per year; single copies, 25 cents; foreign postage $1.00 per year additional except Canada. Entered as second class matter, March 9, 1938, at the Post Office, Chicago, Illinois, under the Act of March 3, 1879. Contributors should retain a copy of contributions. All submitted material must contain return postage. Contributions will be handled with reasonable care, but this magazine assumes no responsibility for their safety. Accepted material is subject to whatever revisions necessary to meet requirements. Payment will be made at our current rates upon acceptance and, unless otherwise specified by the contributor, all photographs and drawings will be considered as constituting a part of the manuscript in making payment.

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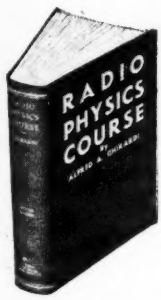

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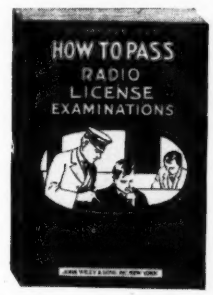

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(Third Edition in preparation.) A book directed to the professional operator. Explains fully all the questions that are met in taking the Federal Communications Commission's examinations for all classes of radio operator. Deals with the Radio Act and the Federal Communications Commission Rules and Regulations. The explanation of ship's radiotelephone and telegraphy and the method of handling traffic is one of the highlights.

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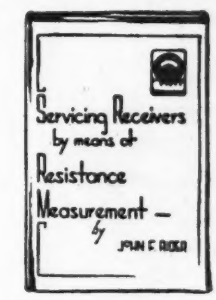
A new kind of servicing handbook. Essential data for your service jobs. A four-drawer filing cabinet could hardly hold all the mass of complex, technical servicing data that was assembled, tabulated, charted and indexed to make this the greatest contribution to Radio Servicing Literature ever published! 52 sections, 134 illustrations, 518 big 8½" by 11" pages.



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Takes the guesswork out of servicing. How to use an ohmmeter in trouble shooting, and correctly interpret point to point resistance measurements. Vastly simplifies servicing problems. You will need this book to speed up your servicing accuracy. Let Rider show you how to use a modern servicing procedure on complicated receivers. Theory applied to practice. 203 pages.

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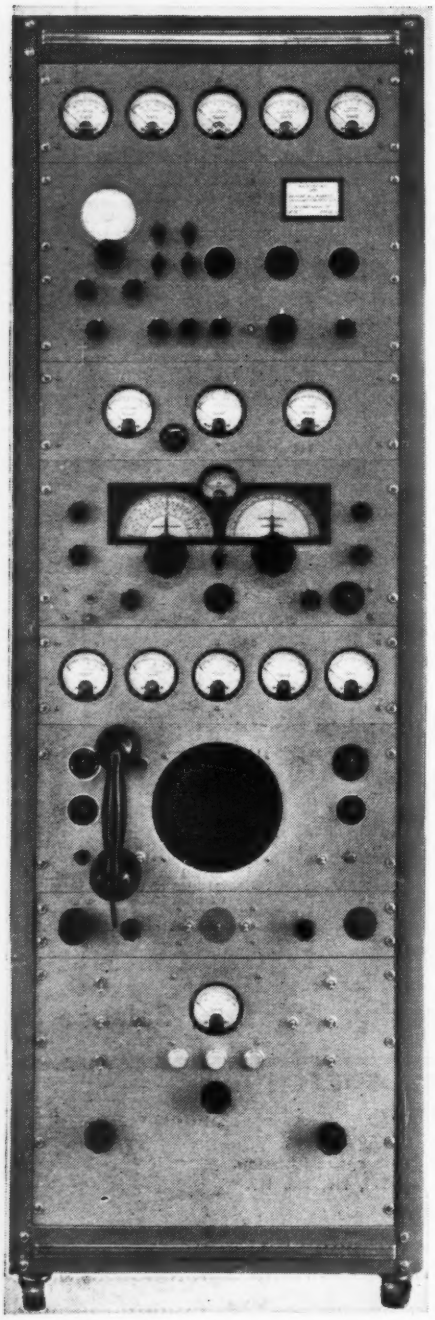
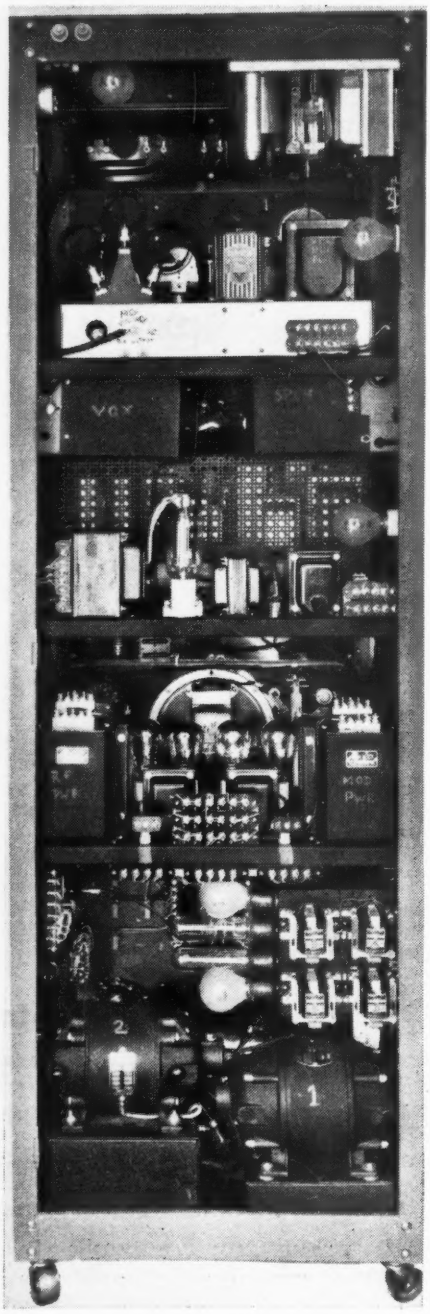
1940 Radio News "ALL

by KARL A. KOPETZKY, W9QEA and OLIVER READ, W9ETI
Managing Editor, RADIO NEWS Technical Editor, RADIO NEWS

Everyone said that it could not be done, but finally a unit was designed and constructed that included almost everything any operator, ham or professional, wants





INTERESTING FACTS ABOUT THE 1940 RADIO NEWS "ALL-PURPOSE" TRANSMITTER-RECEIVER

The unit contains:

305 different terminal connections.
54 different controls.
12 different relays.
40 control knobs.
14 meters.
25 switches.
3 pilot lamps.
13 indicator plates.
3 input plugs.
33 tubes.
4 crystals.
7 25-watt light bulbs.
3 generators—equalling 1000 watts of 115 v. AC.
34 transformers and chokes.

and:

it weighs over a ¼ ton.

The unit was built in about 600-man hours, and is valued at $5,000.

★

OUTSTANDING FEATURES OF THE 1940 RADIO NEWS "ALL-PURPOSE" TRANSMITTER-RECEIVER

1. Full operation from 115 v. AC or DC.
2. Automatic keying.
3. Automatic voice-controlled carrier.
4. Two types of CW monitoring.
5. Complete 'phone monitoring.
6. Complete manual control if desired.
7. Handset-microphone-loudspeaker operation as desired.
8. Push-to-talk operation.
9. Peak limiting modulation.
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11. 6-band superheterodyne included.
12. 160M-10M band operation.
13. Choice of ECO or Crystal exciter.
14. 100% safety & overload factors.
15. Overload & Underload protection.
16. Audio cutoff for QRM conditions.
17. Automatic bias supply.
18. AC or DC operated relays.
19. Commercial construction throughout.
20. Phone-CW switching.
21. Fully metered circuits.
22. Fixed neutralization.
23. 200-watts input on all frequencies.
24. Automatic antenna changeover.
25. Matched receiver input to 73 ohm transmission line.

★

PURPOSE" TRANSMITTER-RECEIVER

IN the forty-six years, total, during which time the authors have watched transmitters and receivers come and go, it has always seemed that the one in their possession lacked certain features which were to be found either in commercial rigs, more advanced amateur rigs or in the experimenter's shop.

For several years the idea of putting all of the features found in these three classifications in one cabinet has titillated the fancy and imagination of the writers. After much research in pouring over the books, burning the midnight oil, the fundamental circuit was evolved. Using this as a starting place, improvements were added and features included until the 1940 RADIO NEWS ALL-PURPOSE TRANSMITTER-RECEIVER was created.

Before going into the technical details, which should enable any ambitious radio man to duplicate this unit, it may be well to consider some of the features used and the reason for their inclusion.

The consideration of 110 volts d.c. operated transmitters has always been vexatious for that amateur or professional operator whose very location made access to 110 volts a.c. lines impossible. This situation is prevailing in certain of our cities and on a great many of our ships, both commercial and pleasure type. The first condition, therefore, to be met was to make a transmitter operate equally well from 110 volts a.c. or d.c. In this way the unit could be moved from shore to ship and *vice versa* without any change in circuit and without sacrificing its usefulness during those months in which either one or the other type of voltage was not available.

The 1940 RADIO NEWS ALL-PURPOSE TRANSMITTER-RECEIVER when operating from 110 v. d.c. mains provides a fully modulated signal of 200 watts input to the final Taylor T55. This is not to be considered the usual portable a.c-d.c. power, especially when one considers that this means an 800 watt signal at 100% modulation. To have increased this power, for example, to 400 watts would have been impractical. In the first place the received signal would only be 1/7th greater than the signal of the 200 watt transmitter; and in the second place in order to make a 400 watt input available at the final tube, the generators would have to be able to deliver 3 kilowatts of power instead of one. The amateur has not yet found out that the ratio of increase of "source-power" does not rise in direct proportion with the gain of input to the r.f. stage. Thus, it would take 3 kilowatts of generators for 400 watts and almost 9 kilowatts of power for 1 kilowatt of 100% modulated input. It has been long known that 200 watts of signal efficiently placed in an antenna and allowing for the usual efficiency coefficient in the final stage will "go as many places" as will a kilowatt, especially in the ultra high frequency bands.

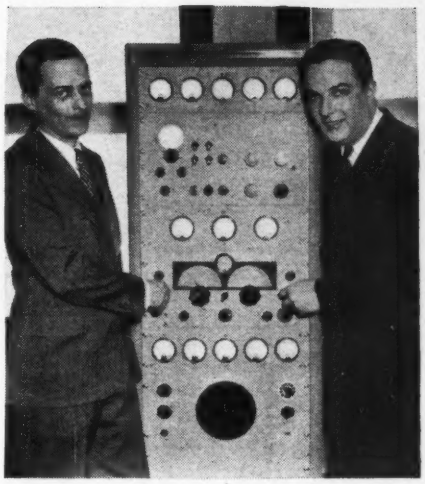
Automatic keying, the joy of every commercial operator, has been added so that the c.w. man need not throw a switch: merely sending a few dots to put the carrier on the air. Automatically, when he finishes his transmission, the receiver comes on and the carrier goes off.

For the telephone operator, the counterpart of automatic keying is provided in the voice control carrier. The *VOX* system which makes this possible is fully described later.

The choice of the *RME* 69 receiver enabled us to include c.w. monitoring as an additional feature. C.W. monitoring is also provided by listening to the buzzer normally used to activate the *VOX* system in the automatic keying setup. Following some of the latest trends in phone transmission audio peak limiting, push-to-talk operation, telephone hand set operation, and modulation percentage indicating were all included.

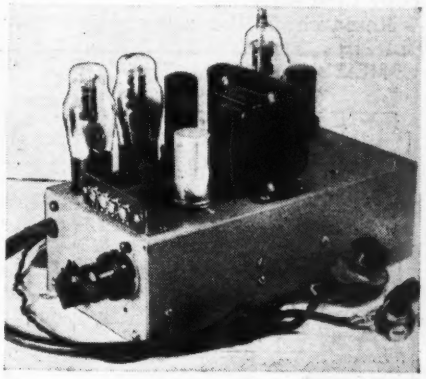
We have always wished to be able to jump not only from band to band, but also within each band and so the choice of crystal control or electron coupled control by means of a *Meissner Signal Shifter* was provided. By choosing the coils carefully, continuous coverage was offered from 160 meters through 10 meters together with variable crystal control in the 20 meter 'phone band. For protection's sake, both overload and underload relays (Guardian) are used and a fixed bias supply using a single RCA84 rectifier tube is placed in the grid circuit of the final T55 tube.

Considering the bias on the final T55, commercial practices were adopted. It is only necessary to bias the tube to that stage which is less than the rated dissipation of the tube itself, figuring the bias for the tube without excitation. Naturally, with excitation the bias should be at least twice cutoff for proper Class C operation. The bias, therefore, was a combination of bias pack operating independently of excitation, and resistor operating only when there was excitation. The 45 v. automatic bias supplied by the RCA84 rectifier was more than enough to limit the plate current of the tube to a figure within the rated dissipation as stated by the manufacturer. With excitation, this 45 volts plus a voltage drop across the resistor creates suffi-



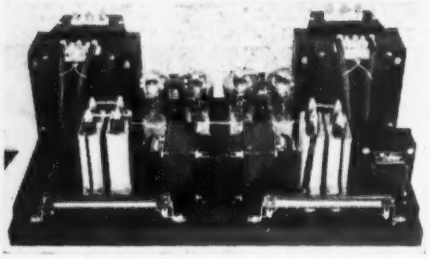
W9ETI, (L), explains the works to the prominent band leader, Bob Crosby.

Ed W9HPW Kelly, Stancor engineer, was a constant visitor during the building of the various power components.

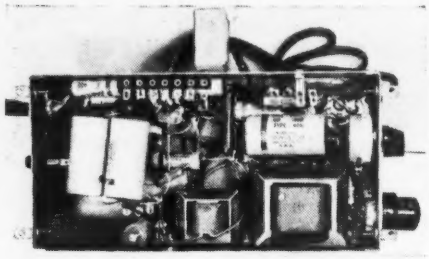


The speech amplifier is complete unit with its peak compression built in.

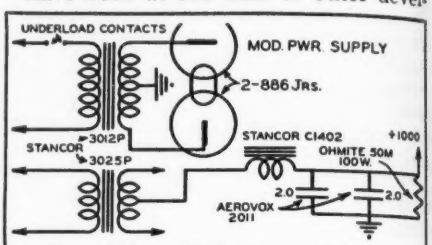
A Triplett Ohmmeter, Model 666H, was the only instrument used for test.



Symmetrical layout was a big feature in the power supply chassis.



There's no wasted space under the chassis of the speech amplifier.

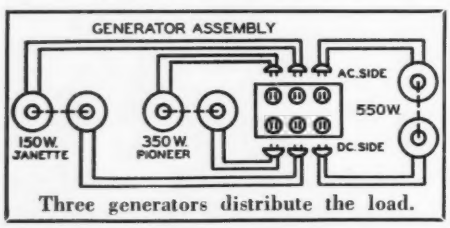


One choke will do for modulators.

cient bias to operate at twice cutoff.

Long ago it was discovered that audio frequencies of less than 2500 cycles in amplitude had a better opportunity to "get through" the QRM than those rising to the usual amateur's goal of 10,000 cps. This audio cutoff is made by means of an audio tone control on the speech amplifier.

During the actual construction of the transmitter, which took over 600 hours, every effort was made to do a

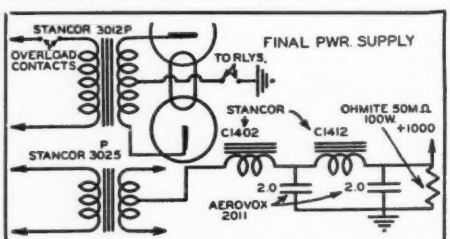


Three generators distribute the load.

real commercial job. At first glance it will seem impossible to have placed all of this equipment in a 5½ foot cabinet (Par Metal). But not only was this done, but there is an excess room of about a foot to a foot and a half left over. Having inspected many commercial rigs we were impressed by the fact that our professional brethren did not "scrawl their equipment all over the map" and we intended to copy their style.

Research in the relay department indicated that a.c. relays could be made to run from d.c. current and the manner in which this is accomplished is explained later. By putting the relays on the d.c. voltage, when using d.c. input, the 40 or 50 watts required to run them could be saved.

It must be remembered that in a d.c. installation where one manufactures one's own a.c. voltage, every watt counts and the problem becomes one where a savings of one or two watts of a.c. is serious and worthwhile. Power



This is a wholly orthodox hookup.

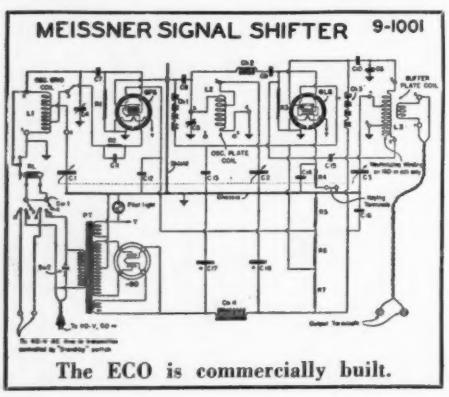
factors of transformers enter into the problem and it will never pay in this type of installation to use a transformer whose current carrying capacities are exceeded and waste valuable wattage in heat.

Briefly reviewing the uses to which this transmitter-receiver can be placed, it was found that it meets the usual requirements for the following services:

1—As a ham rig.
2—As a ship-to-shore marine rig.
3—As a commercial c.w. rig.
4—As a short wave broadcast transmitter.
5—As an airport transmitter-receiver.
6—As a military service transmitter especially for use with the Navy where 110 volt d.c. is available and on those ships (believe it or not, the Army operates ships) of the Army which do not have 110 volts a.c.

The efficiency quotient of the entire unit is remarkable, not only from an operating but also from a technical standpoint. Impedances are carefully matched. Controls, while numerous on the panel, are few in operation.

The authors believe that the unit at once represents a visible proof of the development of radio by the amateur fraternity to the stage where it can match the best that the commercials can put out in a rig of similar qualifications. All of the circuits used have been at one time or other developed by amateurs and it is to their credit that they can be so joined together as to create a transmitter-receiver which has so many varied and different uses.



The ECO is commercially built.

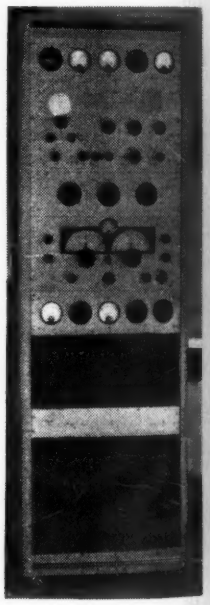
CONSTRUCTION

General Information

The amateur operator has long followed certain general set-forth ideas in the construction of the various component units which make up his transmitter. Much can be learned by following the general procedure used by the manufacturers of marine and commercial radio transmitting equipment. Compactness is the keynote of this latter type of construction and mechanical details are carefully planned in order that the assembly be one of rugged and foolproof design.

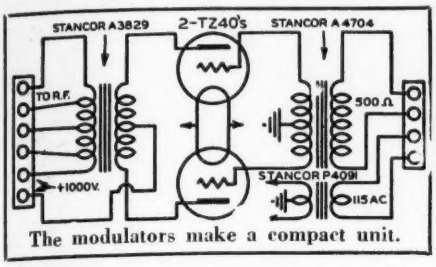
As mentioned earlier, the entire transmitter and receiver will operate both from 110 volt, 60 cycle, a.c. and from 110 volt d.c. Reference to the illustrations will show that the lower compartment houses the three converters, one of which is a heavy duty type rated at 550 watts, one of 350 watts and one of 150 watts output rating. By distributing the whole load to the three generators, all will work at best possible regulation.

It is extremely important that the generators be supported on a shock-proof mounting. This has been accomplished by using a live sponge rubber mat which is 1" thick. Vibrations which nominally would be transmitted to the cabinet are now confined to the units themselves.



The half-way mark of construction.

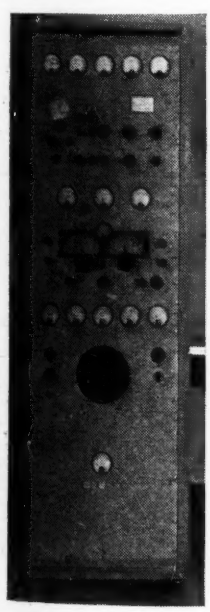
The four Ward-Leonard controlling relays are mounted on a sub-chassis which measures 7" x 7" x 2", and are completely wired, together with the 25-watt lamp bulbs in series with coils to lower the current for 110 volt d.c. operation. When operating from 110 volt a.c. supply these bulbs are removed and are replaced with 5 ampere fuses which are effective shorts, at the same time providing adequate protection to the relay coils. Amphenol female receptacles are used together with rubber insulated adapters to hold the 25-watt lamps so that they may be removed by the usual plug-in method.

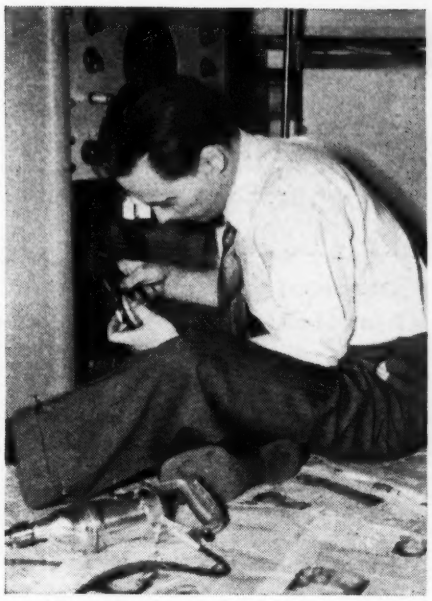


The modulators make a compact unit.

Inasmuch as the main control panel is the heart of the power supply system, it was located where it would be accessible for wiring to the various units. This has been done by first mounting all of the individual switches to the panel and by mounting terminal assemblies by means of brackets to the rear of the assembly where all inter-connecting leads may be secured with a screw driver. It is extremely important that the terminals be identified by either numbers or by using paper tags as no wiring takes place before all of the units are mounted within the cabinet and connections are easily forgotten.

To the left, looking at the rear of the bottom deck will be seen an autoformer which is used to control the voltage coming from the 550-watt generator. This unit is made variable from the front panel and is driven by means of a flexible cable which is of the type used by the commercial manufacturers and may be obtained from the S. S. White Dental Manufacturing Company. Directly in back of the autoformer and on the same side of the cabinet is mounted a small 9"x5" chassis which contains the female plug assembly together with the necessary terminal strips. The main line cord coming from either the 110 volt a.c. or d.c. city main is plugged into the input receptacle on this box and by means of plugs it is possible to arrange the connections so that either a.c. or d.c. will be applied to the transmitter. It is well to color-code or otherwise identify these various receptacles and to keep the d.c. coils isolated from those used on a.c.


Almost finished, it looked like this!




Literally, the work went on day and night. Paper development was the least part of the job, while the greatest labor was in interconnecting the units.

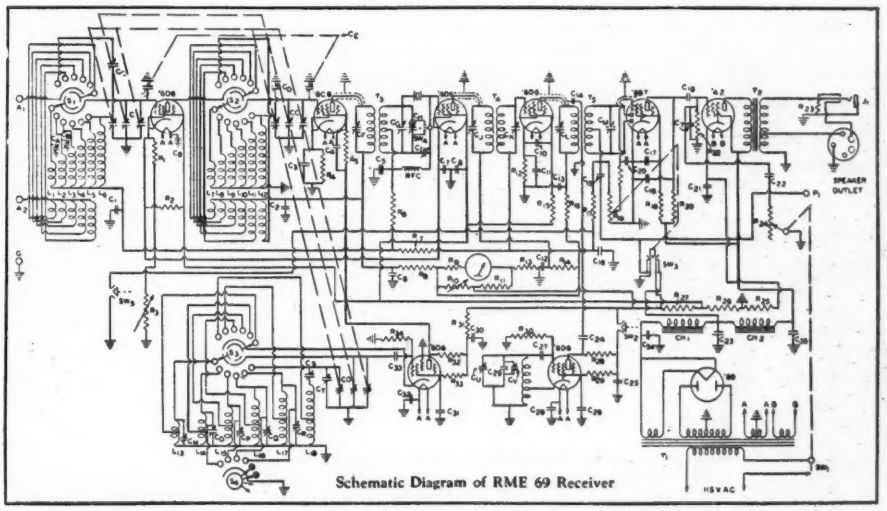
The main controlling switch wiring is located directly back of the switch assembly on the front panel above the three pilot lamps. The *green* bulb serves as an indicator to show the operator when the 150-watt generator —the *amber* when the 350-watt—and the *red* when the 550-watt generator is running.

One of the most important considerations as far as wiring is concerned is the size or diameter of the connecting leads. It must be remembered that when operating on d.c. the load to the generators will require the use of either solid or flexible wire, which should preferably be of the Number 10 gauge, as any IR drop caused by resistance would tend to lower the overall efficiency of the converters and cause a diminishing of output.

Liberal use of spaghetti tubing will prevent shorts where wiring is crowded. The constructor of this type of equipment will do well to color-code the wiring as regards to the different types of current, namely—AC and DC. In this way proper reference may be made to either type of current and wiring will be greatly simplified by following the above procedure and mistakes will be less likely to occur. Provision for bonding of the cables should be made in the form of metal straps.

Directly above the three converters and mounted on the back edge of the first shelf is located a series of terminal lug assemblies which connect by means of cable to the relay control box. It is possible to remove the entire assembly consisting of the control box and the terminals by loosening the two screws which hold the latter and by taking out the three insulated screws which mount the control box. Between the inside of the cabinet and the metal box is mounted a live sponge rubber strip. The purpose of this construction is to eliminate the chatter which is to be expected when power

(*Pse QSY to page* 54)


Schematic Diagram of RME 69 Receiver

Facsimile - Home Radio Newspaper

To go to sleep and wake up with your daily paper all printed via radio, is the goal of facsimile.

Installed, facsimile sets take up no more room than a good broadcast set.

ALTHOUGH much has been written and much ballyhoo has attended the development of facsimile and its use in the home, it was not until recently that the technical staff of RADIO NEWS was able to get hold of a commercial job and make an actual field test in a home other than the laboratory. While no circuit components are included in this article, it is believed that sufficient information is given on what may be expected at the present time from the facsimile situation.

The Mutual Broadcasting System maintains a facsimile chain which operates Friday night and here in Chicago a one and a half hour program of facsimile is transmitted over WGN from 1:00 until 2:30 A.M., local time.

The receiver on which the Crosley *Reado* was placed is an ordinary broadcast set with extra wide AVC action. Connections are made in back of the cabinet to the Reado and a time clock automatically turns on the facsimile at 1 o'clock in the morning when set. This time clock turns off both the *Reado* and the receiver at 2:30.

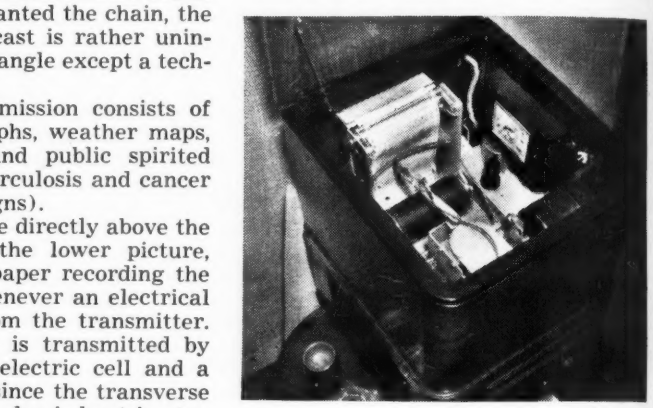
Reception has been excellent locally, and a strip showing the exact reproduction is to be found on the page. Because of the experimental nature of the FCC license granted the chain, the information broadcast is rather uninteresting from any angle except a technical one.

The usual transmission consists of cartoons, photographs, weather maps, base-ball scores and public spirited health topics (tuberculosis and cancer prevention campaigns).

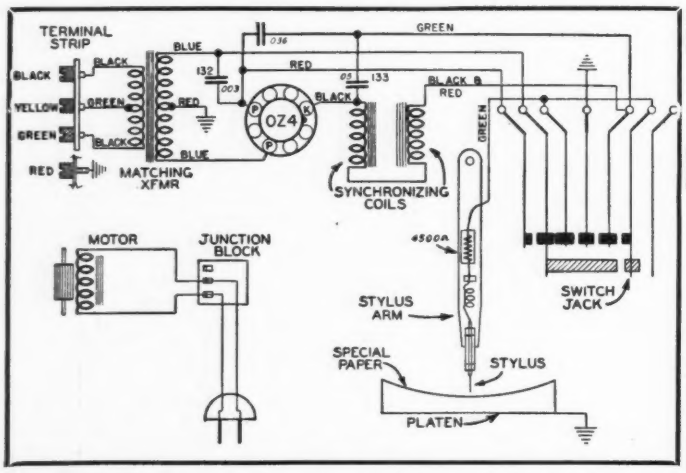
The stylus, visible directly above the roll of paper in the lower picture, moves across the paper recording the signal in black whenever an electrical impulse is sent from the transmitter. Since this impulse is transmitted by means of a photo-electric cell and a beam of light and since the transverse movement of the stylus is kept in step with that of the beam of light, the facsimile reproduction exactly matches the rate from which the transmissions are made. Photographs, especially, come through very well.

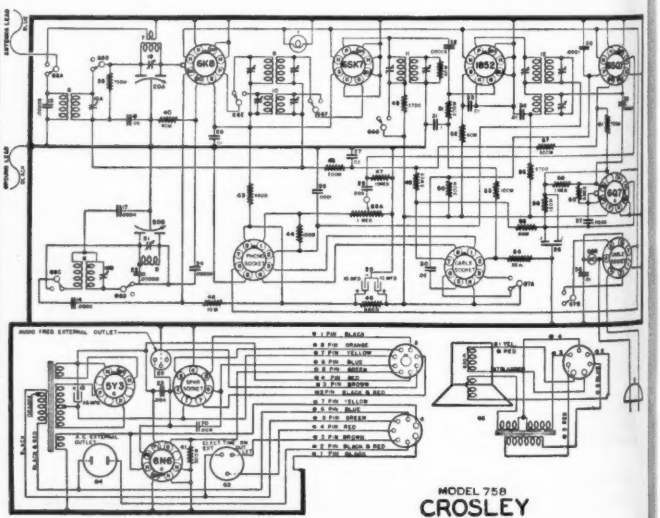
In transmission, a 4-inch wide copy is scanned by a small spot of light 1/100 of an inch in diameter at the rate of 1/100 of an inch of copy (lengthwise) per second. This light striking the paper is absorbed by the black characters but reflected from the white background, striking the plate of the photo-electric eye mounted in the small black cartridge above the light. In this way the electric eye differentiates between black and white as it generates electrical impulses.

(*More facsimile on page* 48)



The printer is automatic in operation, and requires little attention.



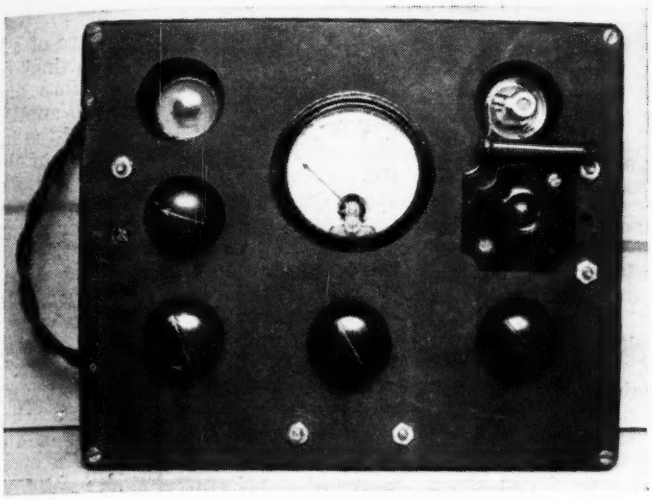


Circuit diagram of the printer, above, and the receiver, right. The latter features a wide-swinging, excellent AVC.

Serviceman's Practical V.T.V.M.

by ARTHUR D. WILLIAMS
Shenandoah, Iowa

A valuable instrument for the radioman. This is another version of the often used V.T.V.M.



Front view of the unit as constructed.

THE resistance of a properly designed vacuum-tube voltmeter is many megohms, as compared with several thousand ohms in ordinary voltmeters, and only twenty or so thousand ohms in the new high sensitivity meter movements. Therefore losses and inaccuracies are completely eliminated and there is no additional voltage drop introduced to distort circuit conditions. The V.T.V.M. is, therefore, widely adapted to potential measurements in circuits of high resistance.

The vacuum-tube voltmeter to be described uses the reflexed arrangement, and the circuit was originated by Mr. Mark H. Biser, of Capitol Radio Engineering Ins., Wash. D. C.

Construction Details

There are several ways in which the v.t. voltmeter may be constructed satisfactorily other than the one to be described. Especially where there may be many applications involving the measurement of r.f. currents, where the input capacity must be kept low, the "goose-neck" construction is recommended, here the r.f. by-pass condensers C1 and C2 should be located at the base of the 6C6 while the a.f. by-pass C3 can be located in the supply unit.

In actual construction the higher the supply voltage the more range of the meter or instrument. There should be a drop of 200 volts across R1 for the plate and target voltage of the 6E5. The remainder is used for bucking voltage (with exception to the approximate 30 volts drop across R2 and R3 for initial bias on the 6C6 and 6E5). It can be seen that the supply voltage must be rather high as this limits the maximum voltage the instrument can measure. The range may also be extended by inserting an additional d.c. bucking voltage in the cathode return circuit of the 6C6 indicated at point C in the diagram.

It is necessary that the total supply voltage be 430 to 450 volts if the maximum range of the v.t. voltmeter is not less than 200 volts. As the power supply has to furnish only a small amount of current, approximately 20 ma., the 4000 ohm resistor and 16 mfd. condenser is sufficient filter in most cases. However, a small choke may be used, if it is found necessary to keep the fluorescent screen or target from flickering. Half wave rectification was employed in order that a small receiver power transformer might be used.

If a maximum range of 100 volts be sufficient the supply voltage can be reduced to 350 volts; however, the voltage drop across R1, R2 and R3 should not be changed. This will necessitate changing R4 to 5000 ohms in place of 10,000 ohms, and the entire 100 volts being subtracted from the bucking voltage only.

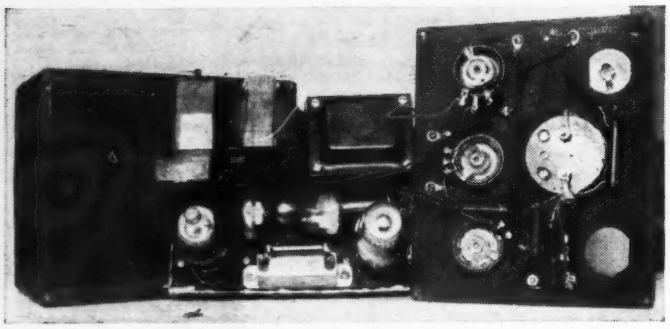
For fine adjustment and measurements at low voltages a 100 ohm potentiometer R5 is placed in series with R4. This low of a resistance so connected gives negligible change in bleeder current to offset the original reference setting of the "magic eye." Care should be taken so that the total bucking voltage never exceeds the range to which the meter is set. In order to obtain a more or less fool-proof low scale of 5 volts, where damage to the meter is most likely to occur, a small push button was inserted in series with the multiplier resistor which will have to be depressed before there will be any deflection of the voltmeter. Then should the selector switch S1 accidentally be turned to the low scale when the bucking voltage is high, no danger will occur.

Theory of Operation

It is necessary that the manner of the operation of the v.t voltmeter be thoroughly understood if it is to be used to the greatest advantage. For the initial adjustment; first short-circuit the input terminals A and B; then set R4 and R5 to minimum or positive end of their voltage range. Because of the high resistance of R6 the plate current of the triode connected 6C6 is practically cut off. This gives about 15 volts drop across R6 which is required to reach approximate cut-off of the 6C6. Or the cathode end of R6 is approximately 15 volts positive with respect to the other end (point x). The potentiometer R2 (reference set control) is next adjusted so that the voltage difference between the cathode of the 6E5 magic eye tube and point x is approximately 23 volts. Thus, this 23 volts bucks the 15 volts drop across R6 and effectively put a negative bias of —8 volts on the grid of the 6E5. This closes the fluorescent pattern to the point where it just starts to come together. If the pattern is inspected very closely it will be noted the scissor like action of the over lapping. It is during this scissor like action of the over lapping that one can find the best "reference setting" of the pattern. It is this which is used as the "zero" setting for all v.t. voltmeter measurements. In practice these voltages need not be measured, the only initial adjustment being the setting of R4 and R5 to minimum, and R2 set at the reference point on the pattern of the 6E5 cathode ray tube.

Assuming now that all initial adjustments have been made we will proceed to measure voltage applied across the input terminals A and B.

Any a.c. or d.c. voltage applied to the grid of the 6C6 will cause the plate current to increase so that the *IR* drop across R6 will increase by an amount substantially proportional to the peak applied voltage. The 6C6 acts similar to that of a simple diode detector when a.c. voltages are being measured.



The complete unit dismounted and laid out so that the method of assembly can be seen. The instrument is portable.

Rectification takes place on the positive half cycle, the condenser C_3 being of high capacity holds the d.c. voltage developed across R6 at practically the peak value of the a.c. Because of the high-resistance circuit across C_3 it must have a *very low power factor or low leakage.* A *good* paper condenser was found to be satisfactory. The value of C1 depends on the frequency of the voltage being measured. The lower the frequency the higher the capacity of C_3 in order to hold the d.c. voltage developed across R6 at the peak of the a.c.; a value of 4 mfd. is good for frequencies of 60 cycles per second or more. When measuring d.c. voltages the grid of the 6C6 or prod "A" must be connected to the positive side of the voltage source.

It may be in order here to complete the explanation by means of a simple example of a measurement made with the v.t. voltmeter. Let us assume that we are to measure the screen voltage on a tube. After the initial adjustments have been made as outlined above, test prod "A" is connected to the screen connection and prod "B" to the ground. This momentarily swings the grid positive on the 6C6 and the plate current increases causing the IR drop across R6 to increase practically proportional to the screen voltage under test. It can be noted now that the pattern on the 6E5 is no longer at the "reference setting" but will have completely opened due to the fact that the bias on its grid will have changed to some positive value. Now the potentiometer R4 is increased (arm adjusted toward the negative end) until the pattern on the 6E5 closes to the original "reference setting," R5 being used for the fine adjustment. After these adjustments the selector switch S1 is set to the proper scale of the d.c. voltmeter "V" which gives the true value of the screen voltage. This gives a direct reading because R4 and R5 simply introduces a bucking voltage equal to the increase in IR drop across R6 which is equal to the unknown voltage across the input prods A and B. Therefore restoring the original bias to the 6E5 as noted by the initial reference setting of the pattern. The d.c. voltmeter is of the 1000 ohm per volt type.

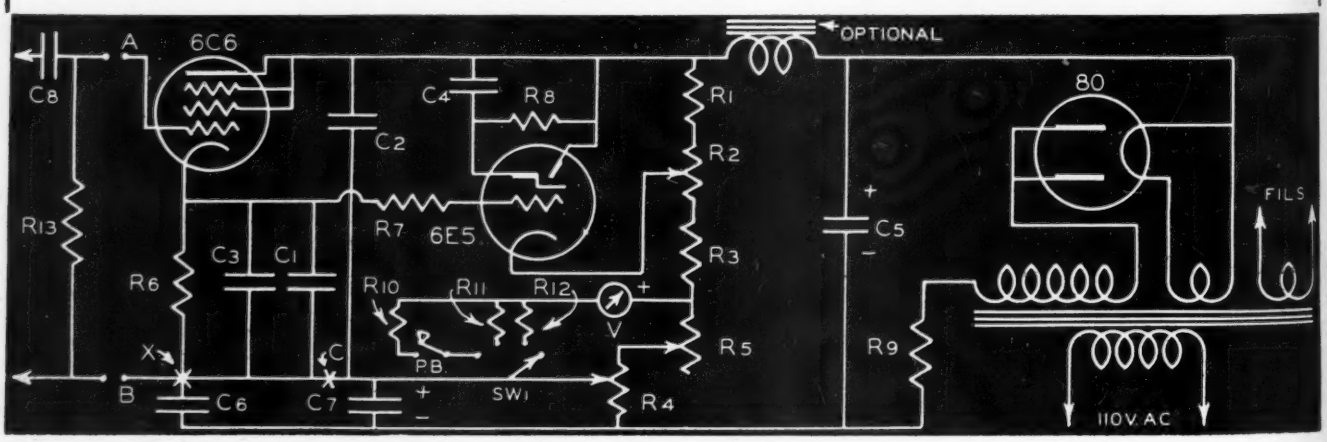
Resistor R7 in series with the grid of the 6E5 is *very important.* Because any voltage above 8 volts across AB will drive the grid of the 6E5 positive until R4 and R5 are adjusted to buck this voltage. If it were not for R7 to limit the grid current due to its automatic biasing, the 6E5 would likely "go up in smoke" because of excessive grid current.

Accuracy

Here a human factor or care of adjustment of the "reference setting" of the pattern on the 6E5 before and after the unknown voltage is applied will determine the accuracy of the instrument, as well as, accuracy of the d.c. voltmeter being used. The d.c. range from 25 to 200 volts gives an approximate accuracy of plus or minus 1 volt. The scale .5 to 5 volts will have an accuracy of plus or minus 0.1 to 0.2 volts on measurements of d.c. voltages. A.c. voltages seem to give a constant error from 0.5 to 1.5 volts; being on the low side of the correct value. This is probably due to the effect the negative cycle of the a.c. has on the static characteristics of the plate current of the 6C6. As the error in voltage is more or less constant therefore the percentage error becomes less as the higher the a.c. voltage being measured. So it may be depended on as being quite accurate at high a.c. voltage readings. However this should not discourage being able to read low a.c. voltages because with a variable source of a.c. current and an ac. voltmeter it may be calibrated. The calibration can, if desired, be made in terms of r.m.s. voltage instead of peak a.c. It may not be amiss here to point out that invariably the voltage indicated by the d.c. voltmeter "V" is in terms of either *d.c.* or *peak a.c.* However the r.m.s. value may be readily found from the peak value by multiplying it by the factor .707 (assuming a fairly good sine wave).

—30—

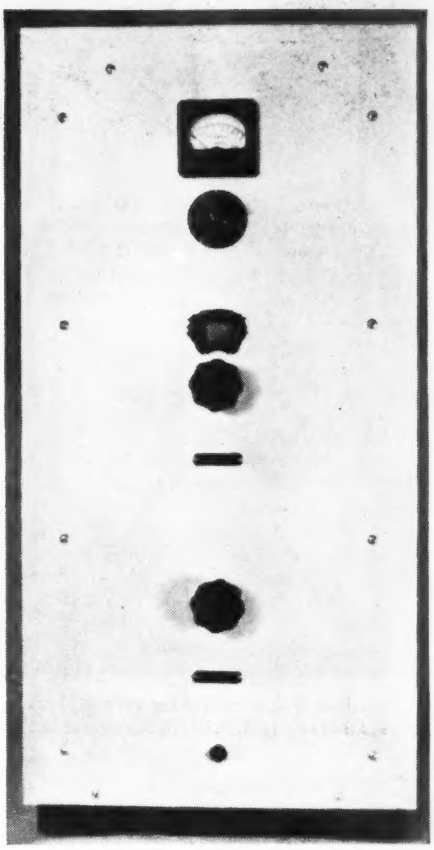
R_1—10,000 ohm, 10 w.
R_2—1000 ohm wire-wound linear potentiometer.
R_3—500 ohm, 2 w.
R_4—10,000 ohm, 10 w. wire-wound linear potentiometer.
R_5—100 ohm wire-wound linear potentiometer.
R_6—2 megohms, ½ w.
R_7—100,000 ohms, 1 w.
R_8—1 megohm, ½ w.
R_9—4000 ohms, 10 w.
R_{10}—5000 ohms, ½ w. Selected resistor.
R_{11}—100,000 ohms, ½ w. } *Selected resistors.*
R_{12}—250,000 ohms, 1 w. }
R_{13}—See Below.
C_1—0.01 mfd. mica, 300 v.
C_2—0.01 mfd. mica, 300 v.
C_3—4 mfd. paper, 400 v. (low leakage).
C_4—0.1 mfd. paper, 300 v.
C_5—16 mfd. 500 v., Electrolytic.
C_6—0.01 mfd. mica, 350 v.
C_7—8 mfd. 350 v., Electrolytic.
C_8—See Below.
"V"—1 ma., d.c. meter.
Swl.—4-pole selecto-switch.
P.B.—Push button.
For the measurement of a.c. when superimposed on d.c. such as measuring the ripple in a power supply a blocking condenser C_8 and grid return resistor R_{13} will be necessary. R_{13} may be a value of 10 megohms; C_8 will depend on the lowest frequency to be measured a value of 0.01 mfd. being sufficient capacity for 60 cycles per second or above.



Something New in U. H. F. Transmitters

by LE ROY LINDBERG, W9DBE
Chicago, Illinois

Utilizing the spring properties of a copper coil, plus the insulation of glass, W9DBE has evolved a new type of u.h.f. transmitter unit.



Three front tuning controls are all that are needed to operate the rig.

IN the last year tremendous strides have been made in the utilization of the ultra high frequencies.

The ten meter amateur band activity is increasing faster than any other of the bands. Airlines are landing their planes blind by the use of ultra high frequency beams. Television is about to be introduced to the public. The medical profession is using the heating effects of the ultra high frequencies to cure many ills. To sum it all up, it appears that we are on the threshold of a new era in the use of these frequencies.

However, with all this activity on the ultra high frequencies no great change has been made in the all important *tuned circuit.* It is a well-known fact that losses increase greatly at the higher frequencies and yet we see many plug-in coils, condensers with contact joints, and numerous other losses still in use today. In order to get the best results on the ultra high frequencies it is imperative that special apparatus be used. It is the purpose of this article to introduce a new piece of apparatus for these frequencies and to describe a very efficient ten meter transmitter using two of these units.

First, I will endeavor to describe the construction and merits of this new type of tuned circuit which I have dubbed a *High Q Loop* for want of a better name.

It consists of an inductance coil of stiff copper wire supported at the center turn by an *Alsimag* support. The ends of the inductance are sweated in two circular copper condenser plates. These plates have holes in their centers for a pyrex compression tube to pass thru. Figure 1 shows the construction of this tube.

The tube "A" passes thru the two holes in the condenser plates. The tube "B" fits over tube "A" and is sealed to tube "A" at the outer end. The tube "C" fits over tube "A" loose enough to slide freely. A threaded stud "D" is sealed into the end of tube "A." Nut "E" forces washer "F" against tube "C," thus forcing the condenser plates "P P" together. The inductance coil acts as a spring and exerts an outward tension on the condenser plates thus counteracting the inward force of the tube. It is obvious the spacing of the plates can now be varied by adjusting nut "E."

The compression tube is supported by two standoff insulators. The compression tube is free to slide in the standoff insulator on the adjustment side but it is held firmly in the opposite standoff by means of a wedge.

Having described the construction of this tuning unit, I will point out its outstanding advantages.

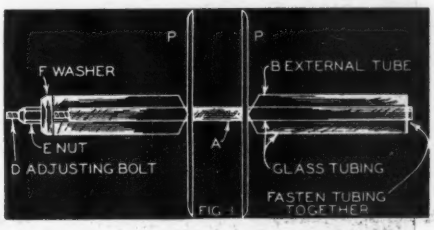
The first point to consider is its minimum of supports. The inductance coil is entirely self-supporting except for the one center tap support. This tap is at zero R.F. potential when the plate current is fed at this point. If the plate current is fed in at one end of the circuit this tap only has one-half of the R.F. voltage impressed upon it. Since it is a high quality ceramic support little loss is incurred at this point.

The only other support for the entire tuned circuit is the pyrex compression tube which passes thru the circular condenser plates. The three standoff supports are of generous length so the tuned circuit is placed well up in the clear. It can be mounted on a metal chassis without any trouble from absorption. It is well to note that the tuned circuit has no other metal parts in its immediate vicinity to absorb energy or distort its field.

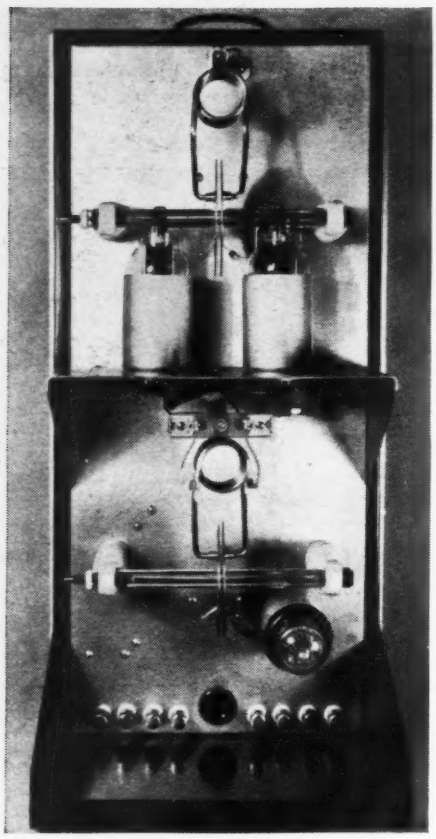
The next point to consider is the minimum of condenser plate edge. It is, of course, obvious that a circular plate has the least amount of edge for its enclosed area and also that it has no sharp corners. R.F. voltage tends to leak at the edge or sharp corners. There, of course, is a slight amount of edge in the hold for the compression tube but since it is an inside edge the voltage does not tend to leak here.

Another noteworthy point is the absence of contact joints in that part of the tuned circuit in which the main circulating current flows. This heavy current flows from one condenser plate to the other and vice versa. Circulating current does not flow to any great extent in the leads to the tubes as the tube capacity is small compared to the capacity of the tuning condenser. Therefore, contact joints in these leads, if they have considerable area, can be tolerated. Connections to the tube elements are made thru flexible copper foil connector strips.

The inductance of the condenser itself is very low. Multi-plate condens-

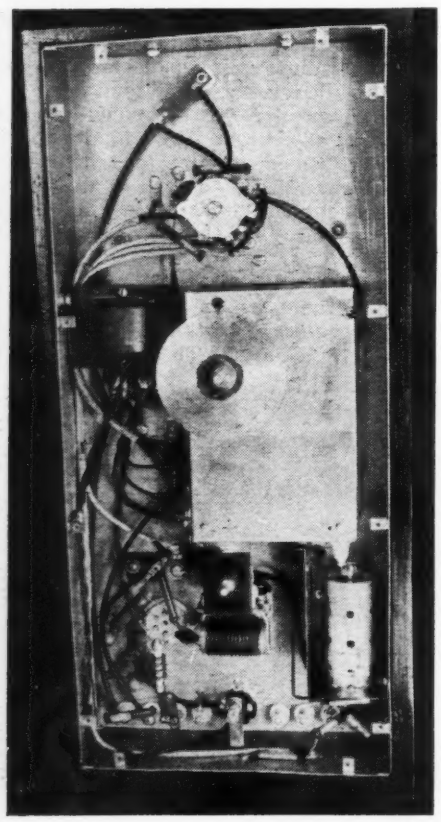


The "heart" of the tuning system.



Push-pull R.F. amplifier on top, buffer below, is W9DBE's arrangement.

The unusual ECO is completely enclosed in its own metal cabinet.



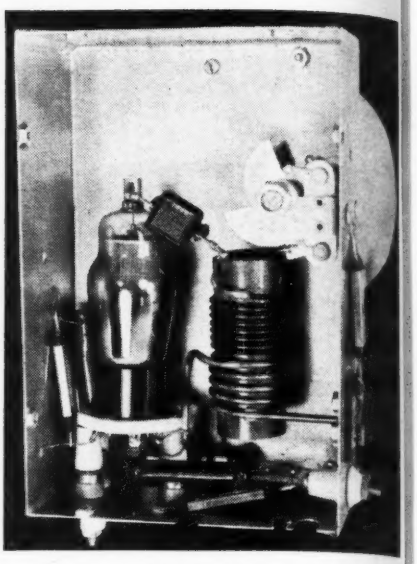
ers, especially the split stator variety, have considerable inductance at the ultra high frequencies. This is due to the fact that the current has a considerable distance to go from one plate to the other. This defect is not so noticeable in this unit as the inductance leads are sweated to the plates close to their centers. This makes the path traversed by the current very short and keeps the inductance in the coil where it belongs. When a condenser is placed very close to an inductance, which is desirable from the standpoint of short leads, currents are induced in the thick metal parts of that condenser. This cannot occur in this unit as it has no thick metal parts. The plates are its only metal parts and they are at right angles to currents induced by the inductance. The circuit is made entirely of copper. This is quite important at these frequencies because of the enormous circulating current.

So far, we have dealt with the tuned circuit's low loss. The inductance with its leads are exactly the same on either side of the center tap and the two condenser plates are identical. It is also most significant that the circuit is far removed from metal parts which tend to upset this balance. Although this condenser is not of the split stator arrangement, I have a neutralized amplifier using these units in both the grid and plate circuit which has proved to be stable in operation. The fact that split stator is not used reduces the spacing necessary between the condenser plates since the plates do not have the plate voltage impressed across them.

Having described this new tuning unit I will now describe the r.f. portion of a transmitter using two of these units. No description will be made of the modulator or power supply as they are a separate unit and conventional in design.

The transmitter is designed for the 10 meter amateur band and has an input of 75 watts to the final. The illustration shows the front view. At the top may be seen a 0—1. milliameter which can be switched into nine different parts of the circuit by the nine-point switch mounted directly below it. Below this switch is a dial for the electron coupled oscillator. Then comes a knob to tune the doubler and finally a pilot light to indicate filament current. The panel is aluminum 2′ high and 1′ wide. The transmitter is only 9″ deep at its base. The main frame of the transmitter is a standard size electralloy chassis base 10″ x 23″ x 3″. This chassis has a wooden frame surrounding it, to give it strength and to form the base. The shelf which supports the final amplifier tubes and acts as a shield is formed from a sheet of electralloy 7″ x 18″. The triangular pieces cut off this sheet are screwed to the side of the frame to give it strength and add to its appearance.

In the back view of the transmitter,



Inside the ECO cabinet shows how carefully each part was located.

above the shelf, may be seen the final plate tank circuit and the two 807 tubes. Below the shelf may be seen the 807 buffer tube, its plate tank circuit and the coupling condensers.

The circuit diagram of the transmitter starts out with a 20 meter electron coupled oscillator, which is slightly different from the conventional type. The circuit is a modification of the Dowe type. The coil L1 has the four turns between the cathode and ground wound of ⅛-inch copper tubing. A pair of No. 26 wires pass through this tubing to furnish current to the heater.

This arrangement gives the oscillator greater stability. With the conventional type the capacity which exists between the cathode and heater is directly across this portion of the coil and any variation in this capacity due to expansion causes frequency shift. For those who might be interested in constructing a coil of this type, the following data may be helpful.

The coil L1 has 12 turns in all. Four turns of ⅛″ copper tubing and eight turns of No. 12 enamel wire. It is wound on a 1-inch coil form which is threaded 5 threads to the inch for the tubing and 8 threads to the inch for the No. 12 enamel wire. The exact lengths of wire and tubing necessary to wind the coil are first calculated. The tubing and wire are then joined together by wrapping the joint with fine copper wire and soldering. All soldering on the tubing, such as a short lead to connect to the cathode and possibly a lug to fasten the end of the winding, should be done before the wires are drawn in.

The heater wires are No. 26 S.C.C.E. with a light coat of varnish. After they are drawn into the tubing it is wound on the threaded coil form. This coil is tuned by a 15 m.m.f. condenser "C" and a 100 mmfd. band spread condenser "C1." With these condensers and the described coil the 10 meter

band is spread over 60° of a 100° dial. The 100 mmfd. condenser is set about half way in.

The oscillator is mounted in a 2½" x 7" x 5" steel box. This box is mounted inside the chassis. Since the chassis is 3" deep, ¼" clearance remains on the front and back sides of the oscillator box. Rubber cushions are mounted in this space to absorb vibrations. This ¼" space also leaves room for the metal dial and its marker. It is necessary to have both the dial and its marker mounted on the oscillator box since the box practically floats on rubber. The dial is viewed through a metal escutcheon in the panel.

The oscillator is a 6K7G. It is mounted inside the box and no special precautions are taken to shield the control grid from the base pins. It is obvious that the control grid cathode and heater are all a part of the same oscillating circuit and shielding would do little good. However, it is good practice to segregate the plate lead as much as possible from the other wiring of the oscillator.

The oscillator is capacity coupled to the doubler stage by condenser C5. The doubler is a 6J7G tube. It is mounted in the space between the panel and chassis below the oscillator. The plate coil L2 consists of 15 turns of No. 12 enamel wire wound on a 1-inch threaded coil form which is threaded 8 threads to the inch. A 15 mmfd. condenser is used to tune this circuit.

The doubler is capacity coupled to the 807 buffer by condenser C6. A milliameter shunt is placed at the ground end of the grid leak R3 in order to read the grid mils.

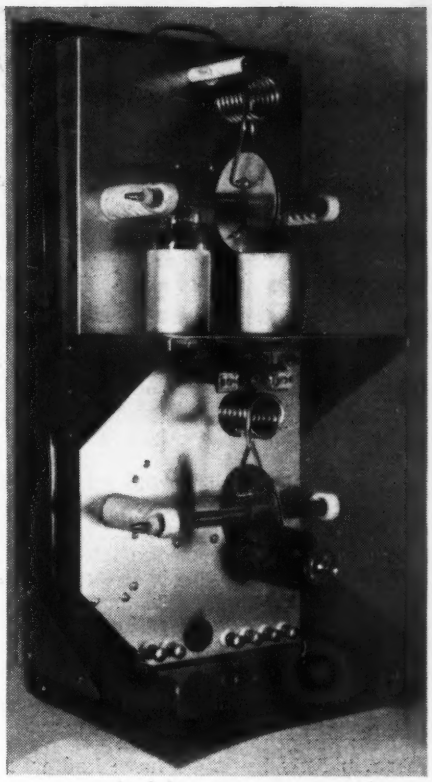
T2 indicates that this wire goes to tap 2 of the meter switch. The plate circuit uses a *High Q Loop L3C3*. The plate current is fed in at the center tap in order to get the proper phased voltage to drive the push pull final amplifier. The *High Q Loop* is coupled to the 807 grids by small isolantite base equalizing condensers C8 and C9. These are receiver type condensers of 3-30 mmfd. capacity.

So little capacity was required that there was considerable air spacing between their plates. Separate grid leaks are used on each of the 807 tubes in the final. A milliameter shunt is placed at the ground end of each grid leak so the grid current of each tube may be read separately. These shunts are connected to taps 6 and 7 of the meter switch. The grid leaks are precision type carbon resistors in order to get an accurate check of the grid voltage. The grid drive can be accurately balanced by adjusting C8 and C9.

A number of readers have no doubt noticed the absence of radio frequency chokes in the grid leak circuits and the plate circuits. I do not believe in using radio frequency chokes unless they are absolutely necessary. Plenty of grid drive was obtained without the use of chokes. The slight losses incurred in the grid circuit because of their absence is insignificant. Power is not at a premium here as the 807 tubes drive so easily. Radio frequency chokes were also found to be superfluous in the plate circuits of the buffer and final stage. The center taps of the *High Q Loops* are by-passed to ground as close as possible to the taps. Radio frequency chokes are great trouble makers when not properly used. However, I believe in plenty of good by-pass condensers.

The plates of the 807 final tubes are connected to the *High Q Loop L4C4*. The *High Q Loop* may be coupled to the antenna by any of the conventional methods. The writer, however, prefers inductive coupling.

It will be noticed that most of the leads to the meter switch are by-passed. It is my opinion, that if a number of leads coming from all parts of the transmitter are crowded together in one small switch, some unwanted coupling might result. Therefore, each shunt or voltage lead is by-passed at its joint of origination and completely shielded in braid all the way to the switch.



Another view of the unusual system invented by W9DBE for 30 MC.

There is only one calibrated dial on the transmitter, namely the oscillator dial. All tuning is done by meter. It is a very easy task to tune up as the meter may be switched from one circuit to the other. Slight changes in frequency may be made by only turning the oscillator dial.

The *High Q Loops* are adjusted by means of a fibre adjustment wrench.

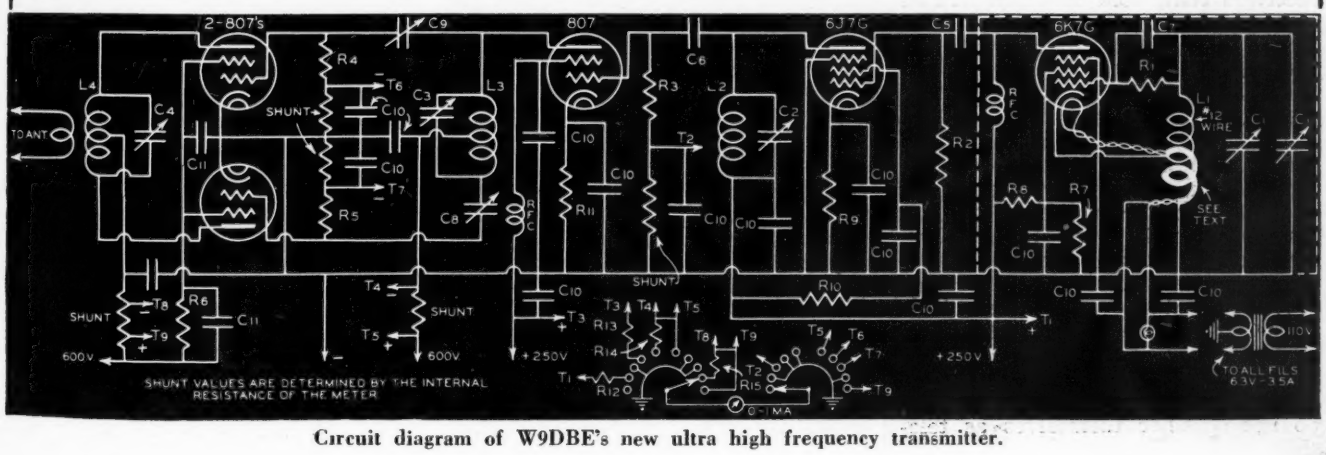
As the 807 tubes in the buffer and final are grid leak biased, the tubes are liable to be overloaded if the cir-

(*Pse Qsy to page* 49)

C—15 mmf.
C_1—100 mmf.
C_2—15 mmf.
C_3, L_4—High Q Loop.
C_4, L_4—High Q Loop.
C_5, C_6, C_7—100 mmf.
C_8, C_9, C_{10}—3-30 mmf.
C_{11}—.002.

All other by-pass condensers 500 mmf.
R_1—100,000, ½ watt.
R_2, R_5—50,000, 1 watt.
R_4, R_5—10,000, 1 watt.
R_6—15,000, 10 watt.
R_7—50,000, 2 watt.
R_8—25,000, 2 watt.
R_9—500, 1 watt.

R_{10}—40,000, 1 watt.
R_{11}—250, 10 watt.
R_{12}, R_{13}—500,000, 1 watt.
R_{14}, R_{15}—100,000, 1 watt.
RFC—2½ millihenry.
(Note.) No value is given for milliammeter shunts as their resistance depends on resistance of meter.



Circuit diagram of W9DBE's new ultra high frequency transmitter.

AS I SEE IT!

By JOHN F. RIDER
Dean of the Servicemen

Should a radio serviceman specialize in any one field to the exclusion of all others, is this month's discussion.

John F. Rider

(The opinions expressed herein are solely those of the author, and do not necessarily represent those of the Publisher nor Editors of RADIO NEWS.)

Specialist!

RECENTLY we wrote an article concerning possible requirements for the average serviceman. Among some of the letters received in reply to this discourse was one which related to specialization. What hope could we offer for the television specialist? In fact, can there be such an individual?

Well, to start with, television is still just a myth in most parts of the United States; in others, it is on its way. Here in New York we have had just about perfect pictures right in our own home. In fact our family are daily spectators and our friends never cease being thrilled at the clarity of the pictures. Television has been available in Los Angeles for quite some time, but not having been there for several years we can make no comments. So the immediate prospects for television activity depend upon where you are.

As to television service specialists—sorry, but we can't see them. Of course many men will be experts upon television receivers, purely as a result of having studied and worked with the units, but that does not make those men specialists. Our opinion is based upon the fact that right today, one out of every three so-called television receivers being sold are combination multi-wave-band home broadcast receivers equipped with television channels and the conventional cathode-ray picture reproducing tube. As a matter of fact some of these receivers also include a phonograph record player. Of course a large number of television receivers being sold or which will be sold will contain just the television tuning channels and related equipment and will be another receiver in the home.

Now, the general definition of a *specialist* is one who devotes himself to a particular branch of a profession, so that we can appreciate the existence of an individual who specializes in the design of certain types of equipment, but not in the servicing of that equipment, particularly in the radio field. It is true that some men here in New York City now are busy installing television receivers, having taken a regular course in television servicing, but we have spoken to these men and they do not consider themselves as television specialists—nor do they intend specializing only in television receivers, despite the fact that at the present moment virtually all of their activity is devoted to the installation of such equipment.

Television is a development in radio communication, just as facsimile is a development of radio communication and if we have television specialists, we should have facsimile receiver specialists. But if we investigate these receivers we find that basically they are radio receivers, superheterodyne receivers and both television and facsimile receivers being offered upon the market contain equipment identical in type to that in use for years. Further, it is quite logical that the man who today installs a television receiver which is also suitable for normal broadcast reception, will be called in to service this receiver, no matter what goes wrong. It is also logical to imagine that if this man installs a receiver with television channels and does a good job, that he will be called to service the older home broadcast receiver. And if we look far enough ahead, we can see all homes equipped with home broadcast receivers of whatever types will then be in use and also television receivers, possibly facsimile receivers, etc., so that the same service organization will be called in to service such equipment—whichever of the units may fail. In other words, the general status which has existed with respect to specialization will more than likely remain unchanged in the future.

Frankly, any man who would say that he services television receivers only and would not tackle the multi-wave broadcast portion of such a receiver would be leading with his chin. It would be the equivalent of today's serviceman who advertises that he is a *t-r-f specialist* and would not service a superhet or vice versa.

Of course, we can see modern service station advertising which would state that the personnel are thoroughly experienced in television equipment installation and service, but not that they are specialists. Advertising specialization in one particular branch of any industry weakens the position of that group in all other branches of that industry. That is a normal reaction on the part of the individual apprised of such specialization. It happens every day in those fields where specialization is a commonplace thing.

You will grant that a radio man who has been in the service department of a particular radio receiver manufacturer for a period of ten or fifteen years, most certainly is a specialist upon such receivers; yet he would be foolish to specialize in those receivers only in the open field. We hazard the statement that the owner of an "A" receiver would hesitate to take his receiver into the Doe Radio Shop when they advertised that they were specialists of ten years standing upon "B" receivers.

Why should television receivers require specialists any more than superheterodyne receivers as against t-r-f receivers—that is from the viewpoint of servicing? Today, being new, the television receiver represents untold complexities. Two years from today, after the dessimination of the required data, the establishment of the proper servicing technique and proper assimilation of the technical facts relating to television, you will find the good serviceman will take these receivers in his stride without any faltering.

This is not said with any disrespect towards the men who have spent years, many years of painstaking development. It is a common-sense analysis of the radio field and the result of investigation in other fields of maintenance. Naturally radio men will be called upon to acquire the proper technical knowledge, but that requirement has been existent for years and the change from the t-r-f receiver to the superheterodyne likewise required further study. And if and when frequency modulation appears upon the transmitter horizon, still further study will be required by those who will wish to service these receivers, but most certainly we cannot envision a television specialist and then a different man who will become a specialist upon receivers employed to receive frequency modulated waves or single sideband transmission.

Who are the men installing television receivers in New York City? They are those who have been doing service work for about fifteen years—who advanced through t-r-f receivers, reflexes

(*Continued on page* 49)

BENCH NOTES

by **LEE WARD**

Service Manager, San Francisco, California

What Work Do You Like Best?

IN the course of my travels last week I visited two friends of mine who were making out badly in a radio shop they started up about six months ago. Hank—who worked in the shop—was genial good-looking, and wore clothes as if they weren't bought from a dock peddler the moment he landed. Whitey—the delivery and pickup man—was the more technically-minded of the two, and carried with him the appearance of carelessness and reticence which so often accompanies talent.

To the outsider it was quickly evident that they should have swapped jobs for the good of the business. Hank should have been doing work that would let his good appearance act as an asset when he called at customers' homes, and Whitey could only operate to best advantage in front of a test bench. As things stand, both of them were discouraged by the unexpected lack of business, and they were beginning to look like the frustrated test rat in the March 6 *Life*.

Many of us are situated in surroundings which prevent an increase of personal efficiency by an expedient as simple as a swap. We may, however, rough hew the ends of our destiny by adapting ourselves to the changing conditions offered by the passing of time. As the servicing business shifts and brings new equipment into use, we may slowly weed out the unpleasant and unsuccessful phases of our business, and force a path in the direction which we instinctively know will lead to more profit and pleasanter work. Try to become better known in the one line which is best suited for your inclination; make an extra effort to do work at which you naturally excel; follow your bent instead of stiffening against it. In practice, this principle may be applied as simply as favoring public address installation instead of auto radio repair.

Once there was a man who, after reading all the ads for mouthwashes, salesmanship courses, saxophone lessons and pancake dough, decided to try them all. "If," he reasoned, "all these wonderful things be true, I shall surely become successful in business and social life by doing exactly as the advertisers recommend. The aggregate result will be irresistible."

He did all these things—and, although he gained a wife and a business, failed miserably. No matter how pretty he smelled, he had a bad habit of walking in front of cross-town buses; unfortunately, no advertiser had mentioned them. This man intelligently determined not to become a frustrated rat: he took his sweet odor and his wife and his business, and moved to another town where there *were* no cross-town buses—and lived prosperously ever after.

I do not vouch for the truth of the story, but the point of adaptability is well taken. Many professional colleagues I have met could benefit themselves if they were less recusant to current trends.

Problem in Conduct

A man and woman enter your shop on their way to the movies. They leave the key to their house with you, asking that you repair their set while they are out. They are good payers by neighborhood reputation, and you have no fear of not collecting.

You do not like the idea of working alone in a strange house, but business is bad, and you need the job—

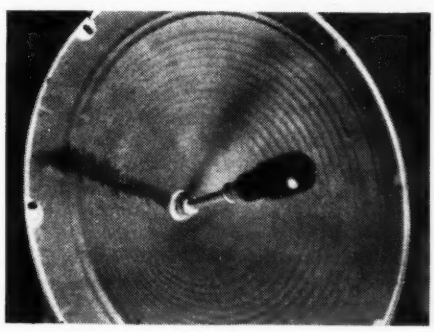
WHAT WOULD YOU DO?

A year's subscription goes to the person submitting the most practical plan of action; six months' subscription to the second.

Lights! Action! Camera!

Monitor Wrench

After repairing an "intermittent" chassis, it may be tested for fading by the stunt shown in the photo. The speaker is laid with the cone in a vertical plane; the juice turned on, and a socket wrench placed against the pole-



piece. There is enough metal in the tip of a three-eighths inch tool to permit a magnetic bite strong enough to hold it horizontally.

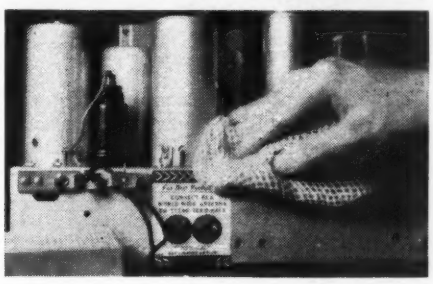
The set may be checked without attention—all day, or all night—with this method; and, if any fade occurs which is caused by the rectifier supply, speaker field, or filter condenser short, the wrench will drop off. If the flux has been constant during the unguarded period, it will stay in place.

During a busy day (we've had 'em), it comes in very handily on a doubtful 6-volt dry rectifier field supply.

Customers Are Not Fused

USUALLY, when a repairman comes into the house, the customer feels obligated to move the set out from the wall. Then, seeing the back of the console for the first time since it was purchased, he is embarrassed by the dust it contains, and says: "Just a moment—I'll get a damp rag and clean it for you."

Don't let him do it! Whether or not you have any particular liking for



him, remember that it is almost as bad to lose a client by electrocution as by competition. When you enter the house, beat the owner to the set; congratulate him for not disturbing the dust if he mentions it, and explain that your shop facilities include those for chassis cleaning. Remove the ashtrays, wedding-present statuary and dim lamps from the console; swing one end out from the wall, leaving as axis the end with the most wiring. This permits you to work in front of—instead of between—the leads and the console.

Remember that a wet rag is dangerous *even when the power switch is turned off;* there is always the possibility the hot side of an a.c. or d.c. power lead being grounded to the chassis between the grommet and the switch.

Snap

THE *Victor 32* is an old job, but as long as great numbers of them compose an appreciable part of the servicing income, we should treat it with more respect than is usually accorded old age.

Most *32* owners do not know of the tone control on the power chassis. Point it out to them after a repair

(*More Bench Notes on page* 48)

A Pure-Tone

by SEYMOUR BERKOFF
School of Technology, College of the City of New York

The author at the controls of a superhet tuner feeding the Pure-tone amplifier..

THE amplifier shown in the photograph and diagram is the result of several months' experimenting by the writer, and represents practically the optimum in design for a unit of its size. Although designed primarily for home use, it has sufficient output to allow its application to good sized social gatherings. Its chief features are an almost distortionless twelve watt output, and excellent frequency response. It was principally the adjustment of the frequency response that occupied most of the writer's time on the amplifier. At the conclusion of the experiments, three non-technical persons were asked to listen to the unit, when connected to an ordinary tuner. One of them remarked that there was an indescribable "something about it that sounds just grand." To the second, the tone seemed "sparkling and yet mellow," while the third admitted he "wouldn't mind having a radio that sounds like that." Such appreciation by laymen causes the writer to feel justified in believing the unit to be worthy of the reader's attention, and a circuit description follows. It will be evident from a perusal of the following paragraphs that the circuits were selected with the utmost care.

The first tube is a 6N7 mixer. Three separate inputs are provided, to which may be connected a tuner, phonograph, and microphone. The tuner should be connected to the low gain input. The output voltage of tuners is usually fairly high, and the application of a high signal voltage to the high gain input would result in distortion at high outputs, since the overall amplification would be more than required to produce maximum output.

As previously mentioned, the frequency response was the subject of much cogitation and experiment. Amplifiers having a flat frequency response curve over the audio range do not sound especially like "high fidelity." In fact, it is often difficult to distinguish, by listening, such a response from that of receivers made five to ten years ago, whose response certainly was not flat. The reason is not difficult to explain. Frequency response curves are usually plotted by feeding the amplifier into a pure resistance load, instead of the voice coil of a loud speaker. While the response of the amplifier itself may be flat over the entire

R_1—*1 meg. pot. with center tap.*
R_2, R_8, R_{15}, R_{19}, R_{21}—*.5 meg. ¼ w.*
R_3—*50,000 ohms, ¼ w.*
R_{11}, R_4—*.5 meg. pot.*
R_5, R_{16}—*3,000 ohms, ¼ w.*
R_6, R_{17}, R_{18}—*100,000 ohms, ¼ w.*
R_7, R_{11}, R_{25}—*25,000 ohms, ½ w.*
R_9—*1250 ohms, ¼ w.*
R_{10}—*1 meg. ¼ w.*
R_{12}—*200,000 ohms, ¼ w.*
R_{13}—*100,000 ohm pot.*
R_{20}—*125 ohms, 10 w.*
R_{22}—*50 ohm wire wound pot.*
R_{23}—*100 ohm center tapped wire wound resistor.*
R_{24}—*5,000 ohms, 10 w.*
C_1, C_4, C_{14}—*25 mfd. 25 v.*
C_2, C_5, C_{13}—*.5 mfd. 400 v.*
C_3, C_9, C_{10}, C_{15}, C_{16}—*.1 mfd. 400 v.*
C_6—*.02 mfd. 400 v.*
C_7—*.0005 mfd. mica.*
C_8—*.00025 mfd. mica.*
C_{12}, C_{19}—*2 mfd. 450 v. Electrolytic.*
C_{17}, C_{18}—*Double 8 mfd. in one can—450 v. Electrolytic.*
L_1—*Speaker field, 1000 ohms.*
L_2—*Speaker voice coil, 8 ohms.*
L_3—*Power Transformer—Primary-115 v. 60 cycles. (Thordarson T-7062) Secondaries—5 v. @ 3 a., 6.3 v. @ 4.5 a., 745 v. @ 145 ma.*
L_4—*Filter choke, 7 henries @ 40 ma. Thordarson T-1326)*
L_5—*Output transformer. (Thordarson T-9008 or T-6754).*
L_6, L_7—*midget filter choke, 10 henries @ 50 ma.*
L_8—*250 henries @ .5 to 8 ma. (Thordarson T-9320).*
S_1—*a.c. on-off switch.*

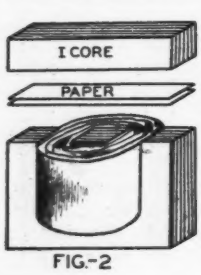


FIG.-2

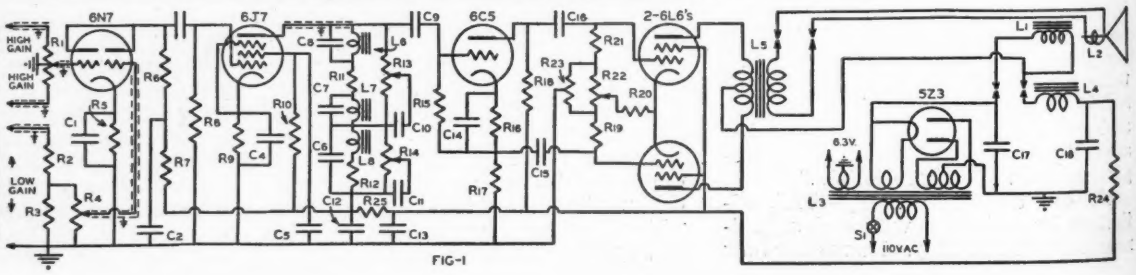


FIG-1

12-watt P.A. System

An excellent unit for use as a P.A. system, a recorder, or with a high-fidelity superhet tuner. A full rich tone will reward the builder.

audio range, the usual "high fidelity" speakers invariably attentuate both bass and treble frequencies, with the result that the actual output closely follows the response curve of the speaker. This deficiency can be overcome by boosting both the bass and treble frequencies by the right amount. The "right amount" proved to be the difficult part of the situation. Various schemes were concocted, tried, and discarded, and the one which stuck is the combination of inductances, capacitances, and resistances in the plate circuit of the 6J7 tube, its advantages being simplicity, low cost, and ease of control.

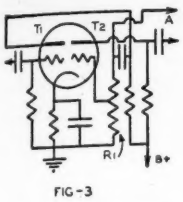


FIG-3

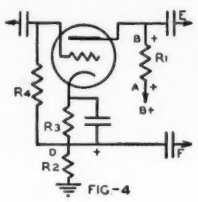
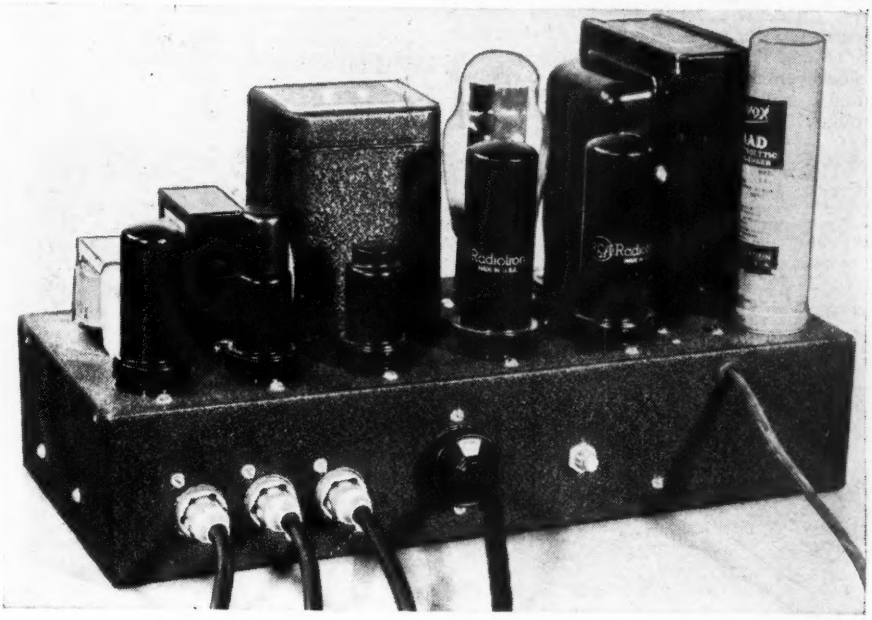


FIG-4



Complete shielding is employed on top of the chassis to avoid hum.

Other things being equal, the amplification of a tube increases and decreases directly as its plate load impedance increases or decreases. By using selective filters which offer higher impedances to certain frequencies than to others, the amplification of a tube can be made to vary with frequency, and the response can be adjusted over any desired range. This was the principle used in boosting both the bass and high frequencies. The combination L7 and C7 form a parallel resonant filter which offers its maximum impedance at 4000 cycles, while C8 and L6 resonate at 6000 cycles. By actual measurement, the combination of the two filters is effective in boosting the range from approximately 1000 cycles to above 11000 cycles, by offering a higher impedance to these frequencies than does R11. Similarly, the combination L8, R12, and C6 resonates broadly at 70 cycles, and is effective over the range from 20 to 120 cycles.

The inductances L6 and L7 are identical midget filter chokes of the type used in small a.c.-d.c. receivers. Each has a rating of 10 henries at 50 milliamperes, and the value of inductance with a current of 1 milliampere through it had to be calculated, knowing the physical dimensions, kind of iron core, and approximate number of turns of wire. The value of inductance desired, for the high frequency booster, was 3 henries. This value probably seems unusually large for frequencies of 4000 and 6000 cycles, but it can be shown that the impedance of a parallel resonant filter at any frequency varies directly as the fraction L/CR, where L is the inductance, C the capacitance and R the resistance, of the filter. For a given resonant frequency, the larger the value of L, the smaller will be the value of C, with R constant, and thus the impedance is proportional to the square of the inductance, or inversely as the square of the capacitance. To satisfactorily provide impedance greater than the value of R11, the inductance of 3 henries was decided on, after much calculation. The practical way of obtaining this value with the choke originally purchased, was to increase the length of air gap in the iron core. Further calculations showed that 2 strips of ordinary typewriting paper would increase the air gap to the proper size. Fig. 2 shows the method of inserting the paper in the core. The strips should be cut large enough to prevent contact between the "I" and "E" pieces. This choke may be purchased at practically any wholesale house.

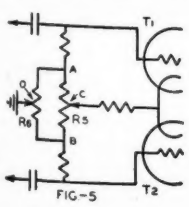
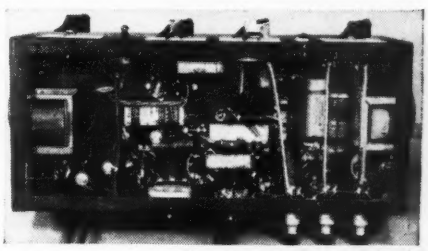


FIG-5

Both bass and treble tone controls are incorporated in the design. Both operate the same way—by shorting out their respective filters to remove the boosting. In addition, the treble control shunts R11 with C10, and thus provides a large range of control. It is desirable to place the chokes L6, L7, and L8 together with their condensers in shields, but if no shields are available, the chokes should be placed in the positions shown in the photographs, where minimum hum pickup occurs.

Since the 6N7 and 6J7 supply sufficient voltage amplification to develop maximum output from the 6L6's, a means of transferring the output of the 6J7 to both 6L6 grids is desired at this point. The signal voltages supplied to the grids must be exactly equal and 180 degrees out of phase with each other. Considerations showed

(*Construct further on page* 46)



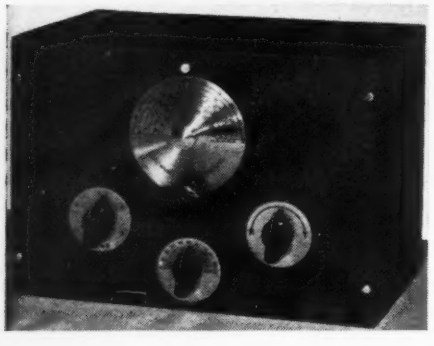
Compact arrangement is necessary for best results. Use short connectors.

What's NEW in Radio

Allen B. DuMont Labs., 2 Main Ave., Passaic, N. J., are making an "Intensifier" type cathode Ray Tube. This tube is designed primarily for obtaining larger and brighter television images at a given cost. The intensifier electrode takes the form of one or two metallic deposit rings near the screen end of the cathode ray tube, and serves to accelerate the electrons after deflection. Increased brilliance is had over the former types used for the same applications. The screen or width of the image is 5". Filter requirements may be satisfied by the used of a light filter condenser and a high resistance bleeder of ten megohms.

Meissner Manufacturing Company at Mt. Carmel, Illinois, announce production of their new Crystal Calibrator, Model No. 10-1160, which generates accurate harmonics at intervals of 1000, 100 or 10 K.C. for calibration of transmitters, radio receivers, service oscillators or other radio frequency equipment. The tester is calibrated to the exact frequency against broadcast transmissions or against Station WWV, the Bureau of Standards station. A multi-vibrator circuit is included to provide signals at 10 K.C. intervals. For 110 v., 60 cycle operation only. The above comes in kit form and may be purchased complete with the exception of the tubes.

The Browning Laboratories of 750 Main Street, Winchester, Mass., have recently announced a new High Gain Pre-Selector. The unit uses a type 1852 tube and is complete with filament transformer in either kit form or wired and tested. The frequency range is in five steps from 64 to 1.6 megacycles.



Main dial accurately calibrated in megacycles. The entire unit is housed in a black metal box with crinkle finish. Dials are chrome plated and vernier adjustment facilities are provided for sharp tuning on the high frequency bands.

Ward Leonard Electric Company, Mt. Vernon, N. Y., have opened a new branch office in Philadelphia, Pennsylvania, at 1600 Arch Street, Room 329. Mr. Frank Beede, formerly of the Chicago Office and for several years attached to the Sales Engineering Department at the Factory, has been appointed as District Manager.

Shure Brothers, 225 West Huron Street, Chicago, present their new dynamic microphones known as the "Unidyne" and the "Rocket." These two units are the result of long and intensive development work and provide a choice of true uni-directional or conventional semi-directional pick-up characteristics. They combine excellent quality of reproduction with stability of performance under severe climatic conditions. The Model 55 "Unidyne" is a basicly new cardioid type unidirectional moving-coil dynamic microphone for broadcast, recording, public address and similar applications. It provides high quality reproduction of from 40 to 10,000 cycles over a wide angle at the front of the microphone. The unit is available in all of the standard impedances. The Model 50 employs the principle of a moving-conductor in a magnetic field. Response is high-quality wide-range (± 5 db. 70-7,000 cycles).

Stewart Warner Corporation are now producing receivers for Television. For a number of years Stewart Warner engineers have been conducting experiments in this field and these efforts have been extended into the line of receivers now available from the above company. These instruments are constructed according to specifications agreed upon by members of the R.M.A. and they claim a distinctive high fidelity sound channel. The cathode ray tube, 12 inches in diameter, reproduces a 441 line image, 9⅝" x 7¼", in effect comparable to the ordinary magazine-photo illustration.

Ohmite Manufacturing Company, 4835 Flournoy Street, Chicago, Illinois, have developed a new 40 ampere cap switch known as Model 412-40 and is one of a complete new series of high amperage heavy-duty rotary multi-point selector tap switches. This new unit provides a more practical answer to circuit switching requirements for battery charges, X-ray and diathermy equipment. They are also suitable for use with tapped transformers, radio transmitters, arc welders, spot welders, ventilating fans, motor control and many other applications. The Model 412 tap switch is rated for 240 volt a.c., non-inductive circuit, is 4" in diameter and is equipped with a maximum of 12 contacts. All porcelain construction, silver-to-silver contacts with other current carrying parts silver-plated. For full details write to the Ohmite Manufacturing Company, 4835 Flournoy Street, Chicago.

P. R. Mallory Company, Inc., Indianapolis, Ind., are now making three new heavy duty vibrapacs. The units are: VP-555—a dual vibrapack with a rating of 300 volts at 200 ma. load, 6.3 volts input. This unit has widespread application in police two-way transmitters, public address equipment, amateur service. VP-557—a 6.3 volt dual Vibrapack having an output of 400 volts 150 ma. This unit finds applications with automobile public address systems as well as amateur and police equipment.

VP-558—a 32 volt Vibrapack of the tube rectifier type. Similar to the VP-554, with a 300 volt 100 ma. nominal output. This unit is for radio receivers on farms, boats and Pullman cars. Booklet containing complete descriptions of the above together with technical data is available upon request.

(*Continued on page* 44)

Homemade Relays That Work

by HOWARD BURGESS, W9TGU
Elliott, Iowa

From the junk heap, or the garage come the basic units which can be fashioned into smoothly working relays for the radioman.

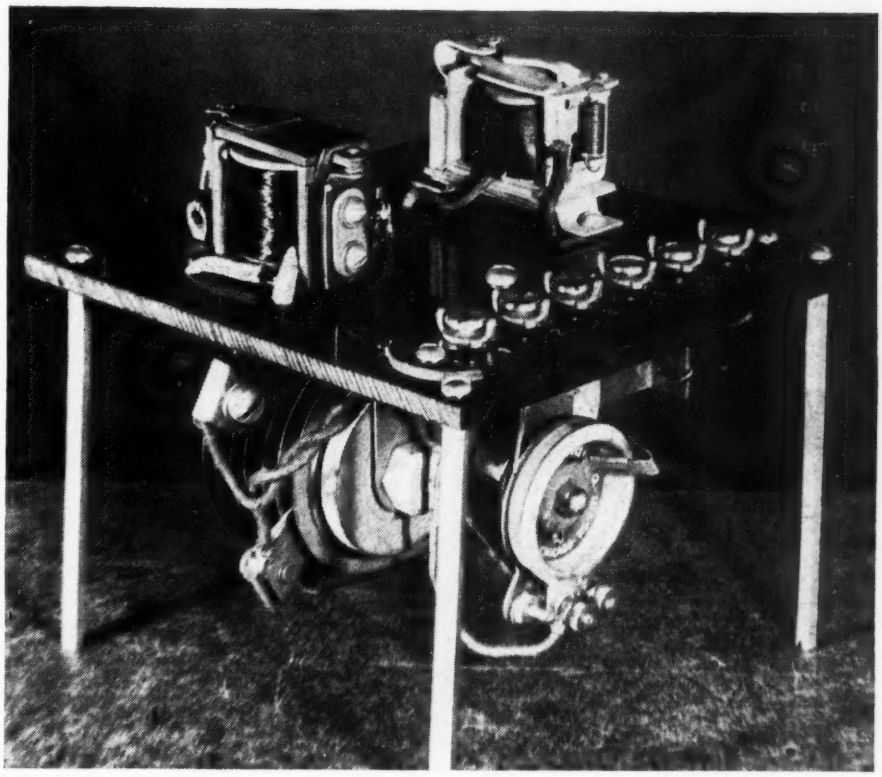
IT'S the little things in life that put the joy in living and it's the little improvements that give added joy to operating. A few hours spent adding the small improvements we have always intended to make will give the old rig the ease of operation that we so much admire in the commercials. It will also give added protection to expensive tubes.

One of the mysteries of ham radio is that the simpler the gadget, the sooner we balk at its construction. A budding young wizard will take the socket hole punch after the baby's bank to buy a shiny new bottle, but still continue to use a switching system that is a hangover from spark days.

With a little work and some salvaged junk the entire transmitter can be controlled from one key at the operating position. If you have no *VOX* system (RADIO NEWS, October, 1938, p. 33), you will have the next best thing, "push-to-talk." All switching is done by means of relays and as an example can do the following things in a small transmitter in the order named.

1. Applies oscillator plate voltage.
2. Deadens receiver.
3. Applies buffer and final plate voltage.
4. Applies high voltage to modulators.
5. Gives overload protection.

These take place in the proper order and none can come on until the preceding action has taken place. Thus high voltage is kept from the final until the oscillator is on and voltage is not on the modulators until they are loaded by voltage being on the final. As many power supplies and switching actions as are needed can be taken care of by adding more relays.

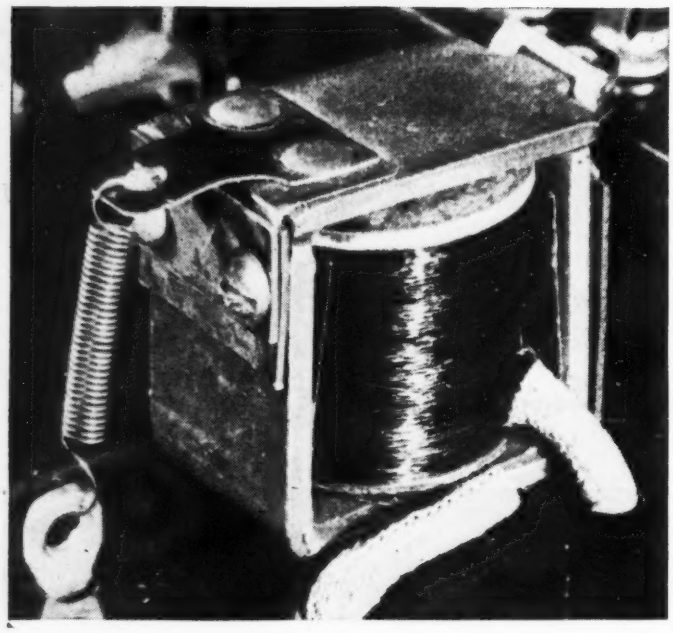


The author's version of a cut-out or overload relay made from junk parts.

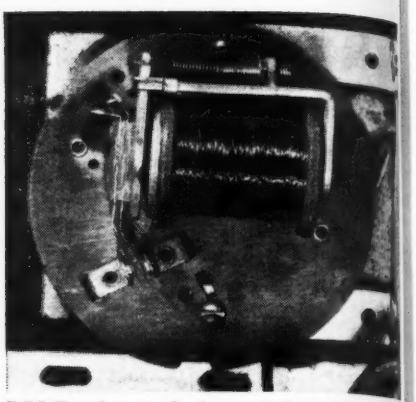
The relays are made of old automobile generator cutouts that were obtained at a price of $0.00 from garages and it matters little how badly they are burnt out so long as the pole pieces and points are still usable. Some of the double throw relays were made out of the relays found in the old style Philco "A" and "B" eliminators but these are not necessary. The cutouts and relays are dismantled and all old windings removed. In some cutouts the center pole piece is riveted in place. In these models the pole piece is cut out with a chisel and a new pole is made from an iron bolt of the same diameter and proper length. The head being filed flat to about 1/16" in thickness. The fiber washers and insulation (FW of Fig. I) are placed on the new pole to keep the new winding from shorting on the frame. If the old insulation is badly burnt it should be replaced with new. With the insulation in good shape, the spool should be wound full of No. 30 enameled wire. Wire from an old filter choke or field coil will answer the purpose.

The cutout is reassembled as it was originally but now comes the most important adjustment. With the unit completely assembled, hold the contact points together as they will be when the relay is closed, and adjust the "pole spacing" (Fig. I) so that the armature lacks about three times the thickness of a piece of this magazine paper from touching the core piece. If it is allowed to touch when in operation, it will refuse to open at times due to the small amount of magnetism that remains in the iron. The spacing of the points should next be adjusted. They should be set to the smallest open spacing that will make a good clean break of the voltage in the circuit. Last, the spring tension on the armature is adjusted. For average work, if it is adjusted to the point where an ounce of pull will close it, it will usually be satisfactory. If no weight is handy, it should be adjusted to the point where it will close quickly with the amount of current to be used in the circuit. Be sure to have enough tension to open it briskly though when the current is removed. The same procedure is followed if any Philco relays are used.

Perhaps the most interesting of all is the overload relay. Many of the commercial units are wound all on one core but these are too tricky for the amateur to make from the junk box. In this case two relays are used. Plate current flows in coil "A." An overload produces power to close contacts "B" which turns the holding current into coils "C" and "D" in relays 1 and 2 respectively. This pulls open the



"Model T" section of an overload relay, showing how the spring is revamped.



DPDT relay made from "A" or "B" pack.

contacts "E" which are in the primary circuit of the high voltage plate transformer of the stage being protected. Contacts "E" remain open until switch "F" is opened momentarily which resets the device. The holding current can be supplied by any means that can supply a few volts of DC voltage but the simplest means was found to be an old dry disc rectifier from a trickle charger. Nearly every ham has something of this sort around the shack. When tied to a 6.3 v. filament winding it supplies sufficient voltage for the relay and draws no current except during an overload and then not over .15 amp.

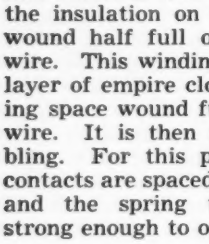


FIG-2

For the relay with the double winding, an old model T Ford cutout was used as it had the largest winding space of any on hand. The riveted-in core piece was removed and a new core made from a 5/32" x 1½" bolt. With the insulation on the new core, it is wound half full of No. 30 enameled wire. This winding is covered with a layer of empire cloth and the remaining space wound full of the same size wire. It is then ready for reassembling. For this particular type, the contacts are spaced about .5 millimeter and the spring tension made just strong enough to open the relay briskly. With these adjustments the relay will go into action at about forty mils and with the shunt resistance it can be adjusted to close at any value above forty. The original flat spring on this type of cutout was cut off about ¼ inch long and bent to extend straight out from the back end of the armature as shown in the illustration. A small hole is drilled in the old spring and a coil spring hooked from it to the base where it is anchored on a spade bolt. Both relays are mounted on a piece of bakelite five inches square and the disc rectifier and variable shunt are hung below. Connections are made to a terminal strip mounted on one end of the bakelite.

A milliammeter was placed in series with the relay overload circuit and a sudden overload applied. The relay would act and cut the circuit before the meter hand could reach thirty on the scale. This shows how quick its action even though made of junk material.

The block diagram is merely a suggested layout and for sake of simplifying it, part of the wiring is left out. The main control switch is placed in the center tap lead of the oscillator power transformer. The first relay coil in series with the oscillator plate closes its contacts when the oscillator comes on and thus turns on the final power which acts on the second relay which closes the modulator and breaks the screen circuit of the receiver. The overload relay is used in the final stage but cuts both buffer and final voltage on overload. This safeguards both stages in case of oscillator failure. The overload relay may be placed in the common negative lead and used to protect the power supply in case of the shooting of a condenser.

By using the converted junk, complete transmitter and receiver switching is accomplished by use of one key. At W9TGU the key is a switchboard double throw type with the off position at center. When pressed to the right it locks for ragchews and long calls. When pressed to the left, due to a spring, contact is made only as long as the key is held by hand. This side is used for short calls and push to talk. -30-

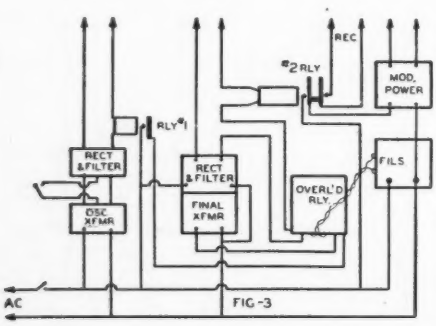


FIG.-3

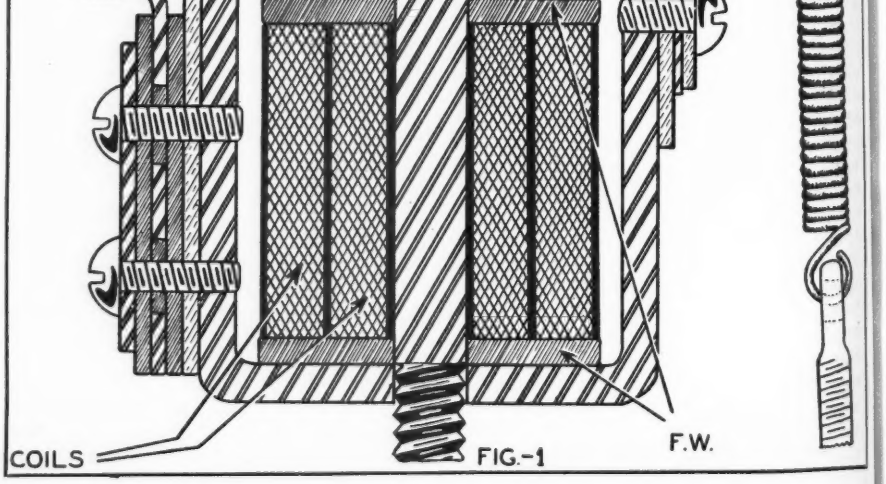


FIG.-1

Serviceman's Experiences

by **LEE SHELDON**
Chicago, Illinois

Sometimes a so-called "charity" job is the foundation of a lot of paid work. Once again "savvy" is the most valuable asset in any radio store.

"AH — the stationary engineer is at work," Al said one day last month, when he saw me at work by the desk. "What's that paperwork you're doing?"

"I am checking over a city map," I replied, "in order to formulate a sales campaign based on sizes of prospects' homes in our territory. The owners of small houses are obviously poor prospect material, and—"

"Why aren't you out getting business?" my partner asked. "I can handle things here in the store."

Al always throws me out into the street whenever he sees me comfortably seated. I am the eternal emigré of *Salutary Sales and Service.*

"This plan," I said, "will, during times of depression, insure the proper ratio between contacts and contracts. It also protects—"

"If you'd worry more about getting business from the run of the prospect mill, instead of sorting them, I'd have filed an income tax report last year," Al interrupted. "Every time you go off on one of those commercial sprees of yours, the hangover costs us money. Sometimes I wish you hadn't bought that *Book!*"

"This is not the first occasion when you have attempted to resist progress," I retorted, "and your sarcasm is based on falsehood. I have *two* Books."

"Double trouble," he muttered. Then, louder: "Scramb!"

"To think," I said bitterly, from a point near the door, "that I came all the way from Europe to get away from dictators!"

Al was about to answer, when a customer entered. We both assumed polite prospect attitude number four.

"Good afternoon, sir," I said. "May I assist you toward possible purchases?"

"Perhaps," he replied, "and perhaps not. It depends. The truth is, I do not have much money to spend, but I am interested in some radio parts. You see, none of us know much about radio, and they have sent me over here to learn."

He was a queer duck—floaty, like *Hugh Herbert,* but inoffensive. He could have said "Woo-woo" without attracting attention. I didn't like his crack about not having much money, and I made up my mind to get rid of him quickly; I answered pleasantly, though: "Certainly, my good man—go right ahead."

"Please tune it in for us, my husband can't look the thing in the eye."

"Thank you. I am Mr. Firp, an active member of the Pepsin Parish—three blocks down, you know—and the other members suggested the use of a speaker for our Sunday services. Not another preacher, you understand—another *speaker.* We thought we could put it in front of the choir, or could we?"

"I don't see what the choir has to listen to," I said. "My idea of a choir is an assembly that gives, not one that takes."

"You must forgive me. I see you don't understand," he replied, "Perhaps it would help if we both talked about the same thing. We want to put a speaker before the boys so the congregation can hear them better. Haven't you got a speaker?" He looked about the store, and suddenly pointed. "There—one like that."

"Oh, that—" I said, knowingly, "that's a *microphone.*"

"I'm sorry," he apologized, sensing my loss of patience, "a microphone. Does the holder come extra? How much is it?"

"It wouldn't do any good alone," I explained, with the tone a person takes in the face of a worn welcome. "You would also need a loudspeaker and an amplifier."

"Tsk, tsk!" he replied sadly, ringing an upper incisor with a finger-nail. "That would probably be more than we could afford. On the other hand—amplification is good for the soul. About the amplifier—how many lamps would it need?"

"Tubes," I corrected, disgusted by the man's ignorance, and determined to plow him under and reap a harvest in a more fertile field. I was about to tell him to come back later when I wasn't so busy, when Al came from the back of the store.

"Good afternoon, sir," he said, motioning toward me with his head. "Don't mind him — he's shell-shocked."

Would you believe it—Al took over and spent more than forty-five minutes with that bloke, explaining what would be necessary on a job like he described—mike by choir, amplifier in foyer, and speaker behind an original artifice in the border of the organ-pipe housing. Firp was dumb, but very interested, and I knew Al was wasting his time. Finally, when the price of the job came out, Firp choked disappointedly, began to paw his left cheek with his fingertips—admitted his church couldn't afford it.

It must be that, when a good man breaks, he flies to pieces completely. Al—my partner, the self-styled business genius—replied: "I am interested in the public address application you have suggested, and I believe I can get it for you at a price you can afford. First, however, I want to see its intended location. Can I get into the church for an inspection tomorrow afternoon?"

"You are always welcome," Firp answered. "I'll meet you there. Good night." He hopped out happily.

"What," I asked Al, "is the gag? Don't tell me you are going to put this job in just for the advertising!"

"That's part of it," he replied. "Of course, I'll be paid—something—for the equipment."

"You must be counting on a reward in heaven," I said. "I shouldn't have to tell you that Pepsin Parish is so poor the church mice have all turned in their union cards—except one, and he's a rat!"

"Here's a signed check," Al said. "Add your signature; then go over to *United* and get that second largest amplifier they play up in the last catalogue. Then get the best matching pickup and turntable they have in stock. On the way back, get some records appropriate for religious services."

I made a quick estimate. "That means that when your whimsicality has played itself out, we will be left with a bank residue of about four and a half kopeks," I pointed out, "and just because a passing customer had a passing thought!"

Al's answer, pertaining to my de-

parture, was of no value to science or industry, so I do not record it.

I was back in an hour, and, as I was unloading the equipment, said: "Before you give this stuff away, think of it in terms of ham sandwiches."

"A clever thought, but hardly worth the night's sleep it must have cost you," he riposted. "You are in the public address business now—whether you like it or not, you'd better 'git in the buggy'."

"I refuse to continue further in your religious crusade," I said, with the firm manner I assume during partner arguments. "Moreover, if Firp comes into the store while I'm here again, I will dismiss him abruptly, in the manner deserved by all counter-irritants!"

"Okay—I'll handle the deal from now on," he replied. Then, as I turned to leave he said: "Hold on a minute—where did you get these records?"

"From my basement, to save us money," I answered. "Even if we go out of business, we must eat."

He glanced at a few of the titles, and said: "A very nice selection: *Pony Boy, Turkey Trot* and *St. Louis Exposition, I Love You.* Here—send these to a wax-works museum for use in some horror display. Since our turntable moves in a horizontal plane, I believe we can do our customers the best turn by selecting flat records. *Edison* will understand."

Things were rather strained between us for a while after that, and we didn't speak of the p-a gear for more than a week. Although we were so busy I wasn't in the shop much, I could tell that Al was continuing with Firp's folly. I was rather anxious to bring my partner to an admission of defeat, but business had taken a turn for the better, and it made both of us feel good, so I determined not to bear down too hard when the crash came. I would temper my wind to the clipped lamb, as Firp would probably say.

One day, after an especially profitable flurry of jobs, we both sat down for a rest we really deserved.

"Through with Firp?" I asked, casually.

"We'll never be through with him," Al replied. "Here—look at this bank balance."

It was at a record high! "Your crusade must have led you to the grail," I remarked, astonished. "How come?"

"It's a story," Al laughed, putting his feet on the desk—an informality which occurs only during prosperous periods—"well worth your study. I put in that mike job for less than it cost. You wouldn't understand—you, whose most complicated business transaction is flushing a peanut machine; you, who would demand an assay before using the Golden Rule.

"The entire congregation, with an enthusiasm induced by my good behavior, got a combination benefit and young talent display together, based on the use of the new mike set-up. Everyone went into the thing enthusiastically—even the former members who have attended church only during family funerals.

"The proceeds more than paid for my cost, and there was some money left over for ready-made mayonnaise for use during the next Sunday-school outing. Church attendance increased. Everyone was satisfied. Because I had been present as engineer on the night of the benefit, riding gain and promoting our stock, all the congregation knew me by sight and reputation; and they began to call us for broadcast receiver repairs. You probably didn't realize it, but about 75% of the set calls we have had since then came from Pepsin Parish.

"On Sundays, the choir sings into a mike—which works out very nicely, because when one of the kids goes sour, his parents can always blame it on a tube. The pastor, who has had to double for organist and preacher, now retires to a chair during organ solos from our platters.

"This summer, the choir will be sent to Wet Lake for a month's vacation. During that time, it will be represented by recordings they will make before they leave the city."

"With what?" I asked meekly.

"With the recording rig I am lending them."

"Oh," I said, disappointedly, "can't you *sell* it?"

"Don't want to," Al answered. "It's more use to us to be used for making records and selling them. Every one of those boys' mothers has ordered a recording of her son's voice, singly or in the group; some of them want both. You see, I didn't take any chances when I installed the apparatus without being paid for it all at once—first, because I knew it would take a demonstration to educate those folks to the use of mike and pickup, and second, even if the plan flopped, we could peddle the stuff at any other church where they could be shown how nicely it worked.

"At present, only two families have combinations, but three others have ordered them from me. They can't afford the most expensive ones, and we'll not get cash—but three new markets have been opened up to us. Now, my little lamb, will you return to the fold?"

"Here comes the prodigal," I shouted. "Get ready to slay the fatted oatmeal! Oh, boy! Where are those addresses of the folks who have been buying records? What prospects! Lemme at 'em!"

"Take it easy," Al said, laughing. "Don't try to force them too much. Pay attention to the work that's coming in for a few weeks until it drops off—don't high-pressure them. Stay in the shop for a while."

Sometimes I look at Al and wonder.

Firp isn't such a bad skate when you get to know him. Yesterday, while I was leaving church, I overheard him say to a fellow-member that I was a very fine young business-

(*Further experiences on page* 45)

ON THE COVER WE HAVE . . .

THIS month's cover illustration shows Lee Sheldon—our *Serviceman's Experiences* author—at work in his home. The occasion followed the breakdown of Mrs. Sheldon's kitchen midget, which Lee at first attempted to repair with household tools. His wife, realizing the uselessness of a 12" screwdriver on a 7" set, and resenting any activity which turned her kitchen into a repair shop, gave him a jeweler's magnifying glass (which she had kept, for sentimental reasons, since Lee gave her an engagement ring) and a pair of tweezers. The picture followed naturally.

One No. 1 floodlight, with reflector, was used for illumination. The exposure was two seconds at *f* 32, using a 3A Kodak loaded with Eastman Super-XX film. Commercial developing and enlarging.

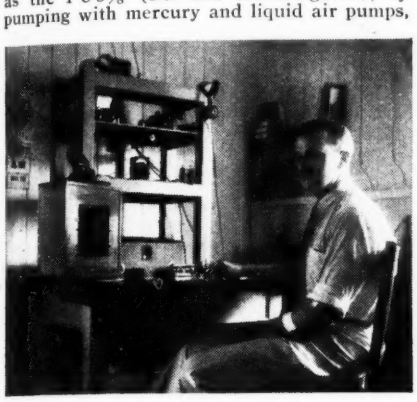
—30—

To: The Triplett Electrical Instrument Co., Bluffton, Ohio.
Awarded: Seal of Acceptance No. 111.0
Product: Dynamic Mutual Conductance Tube Tester Model No. 1615.
Description: True dynamic mutual conductance tube tester with simplified push-button control. So simple now anyone can use. Direct GOOD-BAD tube reading on two-color scale. Separate tests for diode, rectifier and ballast tubes. Checks all receiving tubes including the new loctal base types. Also tests gaseous rectifier tubes. Both filament connections are made through push-button switches allowing for roaming filaments. Same is true of plate, screen, C. G. location switches, etc. Separate Gas test and conclusive neon shorts test. Rotating chart has data for more than 200 receiving tubes —plus all ballast tubes.

To: The Triplett Electrical Instrument Co., Bluffton, Ohio.
Awarded: Seal of Acceptance No. 111.1
Product: Dynamic Mutual Conductance Tube Tester Model No. 1616.
Description: Same as above plus Volt-Ohm Milliammeter with ranges: D.c. volts 0-10-50-250-500-1000 at 1000 ohms per volt; d.c. ma. 0-10-50-250; .2 to 500 ohms; 300,000 ohms, 1.5 and 3 megohms. A.c. volts 0-10-50-250-500-1000 at 400 ohms per volt. Special chart permits decibel readings against volts to 42 decibels. Two plug-in rectifiers: in tube tester and volt-ohm-milliammeter circuits. Front illuminated instrument also indicates when tester is connected to supply line. Attractive all-metal case, lustrous satin finish. Sloping panel. Removable cover. Case size 15¼"x11⅝"x6½". A.c. operated including ohmmeter, 60 cycles, 110 volts.

(*More S/A on page* 44)

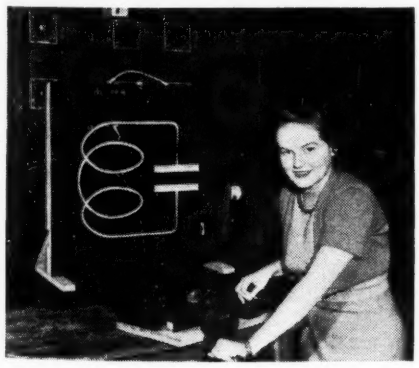
THIS story, according to W9ISR, which emanates from the same source as did the rockaboar story published in this column a couple months ago, is the truth and nothing but the truth s'help me Hanner. It is a well known fact that in order to produce a good transmitting tube it is essential that a high degree of vacuum must be maintained. This is accomplished by certain manufacturers of certain types of tubes, such as the *PU6⅞* (six and seven-eighths), by pumping with mercury and liquid air pumps,



A rare pix of VR4AD, British Solomon Islands. Sent in by Leo Herz, Chicago.

etc. However, there are other manufacturers who will never use this practice; and there are many tubes available, such as the *10 KW*, the *EZ 1000* and the *FB 500* which are filled with genuine *Wempusite*—the only perfect vacuum material in existence.

Wempusite may be obtained by machining the carcass of the three-toed *Wempus*, the *Giant Flying Wempus* or the *Ring-tailed-hairy-chested Wempus*. Wempusite lathes using diamond cutting tools, or muck saws, may be used to shape the material to fit the various tubes being made. The material is quite hard, about the same hardness as quartz and for this reason possesses optimum Q. Enormous output is obtained at



A gadget showing how a condenser works. Built by hams for the NYWF.

efficiencies as high as 733% with only 10% modulation at 7$^{1}\!/_{16}$ cps, dinosaudial wave. In fact removing the quartz plate in rigs using all *Wempusite Tubes* invariably resulted in greatly improved frequency stability. [*Gosh!!!!* Ed.]

W9TLQ is said to have gone on a reducing diet. Last minute reports have it that he is now down to mpty-mpt-mpty pounds. Nice going, old timer. Be seein' yah on 5!

The fone boys on 160 meters are all in a dither. Someone has come up with the screwball idea to chase all the class "B" boys off that band and make 'em go down to ten and five meters. The situation seems to be under control, however. These funny rumors have a habit of popping up from time to time scaring the daylights out of the boys, then dying down until another lunatic gets an idea.

Funny how things work out sometimes. One of the forty meter boys has been struggling for years with a pupil who has mastered the code and theory but just won't take the exam. This fella can really copy, takes up to thirty per and as for theory, well, he really knows his onions, having been an engineer for years. Our ham finally got a brilliant idea. He started to work on the pupil's XYL. At first she didn't know a thing about it but she had plenty of enthusiasm. *Now she has the ticket*, the rig is on the air and the pupil is in the doghouse where he belongs until he musters enough ambition to go after his own ticket. This is really a funny situation when one considers that this gentleman has several hundred dollars tied up in amateur equipment, a three hundred dollar receiver and all the gadgets necessary to operate a really first-class amateur station. The XYL is rubbing it in plenty now she has the ticket but he just just grins and takes it as if he'd planned it that way all the time. In fact, he seems as proud as if he'd gone and gotten the ticket himself.

W9IRY is now on forty meters with 200 to 400 watts input using a 203A in the final. We stand on our constitutional rights and refuse to divulge whether this item has any connection with that immediately above.

WONDER why the Asheville, N. C., *ARC*, a mag of the local radio ham's club, uses the words "Der Tag" to denote the date of their big hamfest. The connotation of the "Der Tag" is rather unpleasant to many, since it was used by the Kaiser to designate the day he plunged the world into the last holocaust. Too many widows of the AEF remember those words,—"Der Tag"—with tears! Let's be American first, last and always!

W4ZZ has wkd over 15 countries during the past year, bring his total near to the century mark.

W4BPD, with a score of 9,000 in the DX contest has only wkd one new country. It was the only one left for him to work! Hi!

That is FA8IH *not* FI8IH!

P4CC is a Dutch Ship on 14.4MC-T9c. He will QSL via N.V.I.R.

W4FCB is wkg Europeans on eight' and twent' wid 12 watts input. Now has a rig on ten and is giving W4CEN and W4AH a run fer their mazuma.

Thnx to W4FIX fer the above five items.

NEW Ham-to-be is Bob Crosby of orchestra fame. He stopped up to the preview of *RN's 1939 All-Purpose, 28-pt transmitter-receiver*, and was he impressed! Bob will go after his ticket soon. Ollie W9ETI Read did all the explaining and got hisself an autographed pix of the Maestro in return for his trouble.

W9ISR is turning into a demon reporter these days. Never misses sending in his stint for this column . . . and on time, too!

Whatsamatter you radio clubs. Howsaboutit that you send in "Specials" to this column and collect our usual fees? Follow the general style here and cash in on gossip. Address, "Hamchatter Editor, Room 2250, 608 South Dearborn St., Chicago, Illinois."

Paley Award winner, W1BDS, at the controls of his shack. FB, Wilson!

G. L. Doseland, legalist fer the Chicago Area Council Radio Club and George Fenton, a chiham, helped prosecute the bootie W9RIS. At this writing bootie W9RIS is being held for the Grand Jury. Conviction carries a possible 2 year term in the clink. *Crime does not pay!* When the arrest was made, a shout, "Bob, Bob, here's the police!" was heard over the 160 meter band by several hamsleuths who were in on the know.

IF the 160 meter W3-phone who signs himself: "This is Atlantic City and suburbs calling" happens to read this, please take note that he has been heard in Quebec with an R8 signal in the 80 meter c.w. band. Hi!

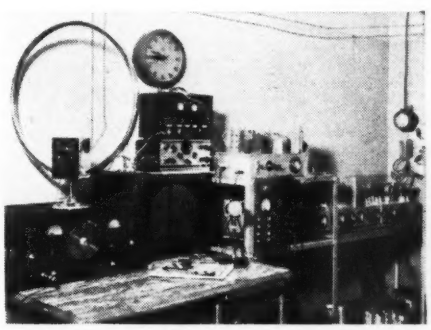
A newcomer on 2039 Kcs. is VE1FS, Centreville, N. B. The XYL and Muriel seem to be losing that fear of the "mike" and work out f.b. Box 20 if the full QTH.

W1IUV reported heard by ON4HS. 1IUV was on 160 fone.

VE2HB is engineer at broadcast station CKCV, Quebec City.

VE2DV is back on 75 fone after about one month on 160.

W1DQK is also back on 160 after several months on 40. 1DQK is quite an old timer on 160.



Notice the direction finder located at ON4KD; also the American receiver.

VE1LO is going to join the 160 gang soon.

VE2OG is on 10 meters and gets out in fine shape. VE2NK is also on 10.

VE2PF tried 40 and worked a W7. Strangely enough, two days later he contacted W7AHN on 160 phone. New regulations in Canada won't permit a new ham to work phone on 160 for 6 months. 10 is the only fone band.

VE2AJ is one of the newest on 2001 kcs. 60 watts input to an 809 on c.w.

A W1 is Port Kent, Me. Had a fine QSO with VE1DU. The W1 was a 3800 Kcs. phone. Hi! No QRM.

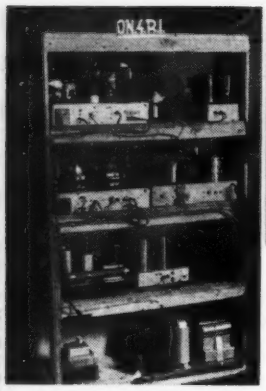
W1HOD is all set for dx with a 20 meter rotary beam, a 20 meter doublet and a 10 meter rotary beam.

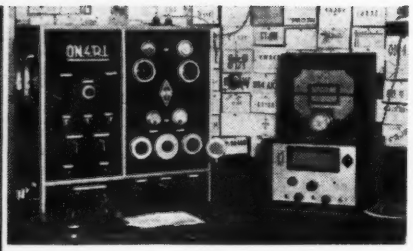
VE1MQ talks of putting up a vertical antenna for 20. He says that every time he calls a "CQ" a W5 comes back to him.

W2HNR went to sleep during a rather lengthy round table and awoke just as the gang were pulling the switch.

W5HSH and W4AIL on c.w. must have a swell time getting those dots and dashes straight.

(*Please turn page*)





Leo Herz of Chicago sent in these two pix of ON4RI. Note the unit-type of construction and the American mike.

Two localmen were talking about their radios. One said that he had just had his radio fixed and that he was well satisfied. "Why" he exclaimed, "If there's static or we don't quite understand what an announcer says we just turn a knob and he says it again!"

G5CV drops us a line to say that he believes that he is the first to receive American television signals in London. He claims that on Sept. 16, 1930, he received a ¾ hour program from *GE* of Schenectady, N. Y., and he has a verification to prove that he did. Does anyone dispute the honorable G5CV's claim either as to priority or as to having received the same signal?

The *RI* is certainly getting active against the booties these last days. We read in the local papers that another unlicensed ham had been caught in Chicago. He was operating in the 160 meter band and using the call W9RIS. *Crime does not pay!*

W2ZC is building himself one of those new overseas beam antennas which is a copy of GSB's. It is for twent' operation and is electrically (not physically) rotated. ZC claims that the rotation is accomplished by introducing phase difference in curtains and additional sections of 600 ohm line, while the array itself is stationary. Incidentally, W2ZC is a former editor of *Time*, and now Technical Adviser to *Time*, *Life*, and *Fortune* magazines. (No advt., hi!)

Had a terrific gripe the other day from a ham on what we said about him in our column. Claims that, "weren't no sech thing!" The payoff came with the closing remark—"Yah didn't even get my call letters right!!!" Ho-hum, that's good fer a chuckle anyhoe!

The Seventh Annual Hamfest of the Fox River Valley Radio Clubs (Bob G. Artman, W9KYY Sec'y), will be held on Sunday, June 25th at Round Lake, Wis. That is approximately 18 miles S.E. of Fond du Lac, Wis. and 25 miles W. of Sheboygan. The grounds will be open at 8 a.m. with events, including the Annual Baseball Tournament and Boat Races starting at 11 a.m. A full program of events has been planned for YL's and OW's. (Yah gotta keep 'em happy! hi!) A swell time should be had by all. Reservations are available from W9KYY, 616 Bluff Avenue, Sheboygan, Wis. A BIG prize list is one of the attractions. Nuff sed!

Incidentally, W9KYY has a swell call—if he uses fone—to call himself the "too wise doggy." Get it? Well here's how. YY equals "too wise" and a K9 is a "doggy." *(Ed., "That's goshawful!" Tech. Ed., "Can u do better?")*

THE Official Bulletin of the Toledo Radio Club says some nice things about *RN* in general, and about this column in particular. You mean it? Tnx!

W8OJO has a fb Collins xmtr and National rcvr.

W8ACW es W8QBM are building up 2½-meter pack transmitters.

New station on the air is NX2L of Greenland. Ditto SP1HH, Poland.

Anyone know anything about ZX4M?

W8ESN is going great guns on 5. Gets real DX wid it, too!

W8TBW is public-spirited. Teaches code to a group of lads that come to his shack.

Williamsport, Pa. telephone company lists the amateurs and their call letters in their 'phone book. Extra swell fb!

Jersey hams, attention. The coupon below is what you should send to the Motor Vehicle Bureau to get those handsome call letters of yours put on your license plate!

NEW JERSEY LICENSE PLATE PETITION

Mr. A. W. Magee
Commissioner of Motor Vehicles
State House, Trenton, N. J.

I, the undersigned, hereby respectfully petition for the issuance of my amateur radio call letters for use as automobile registration plates on my car in 1940.

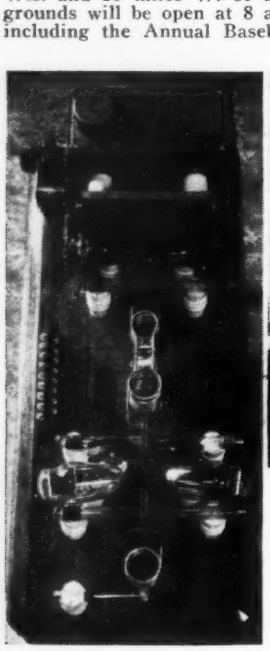
Signed .....

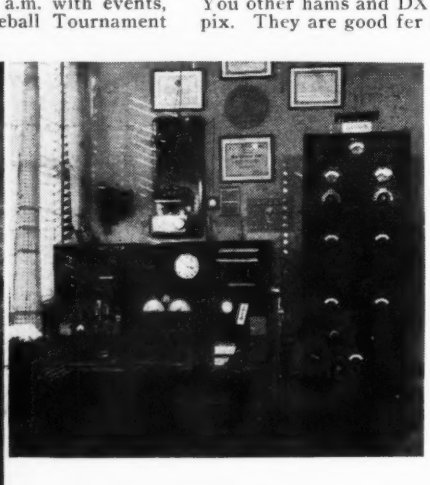
Address .....

City ..... **State** .....

Amateur Call .....

Leo Herz, of Chicago, forwards some very interesting pix of two ON stations. They appear elsewhere on this page. Thanx Leo. You other hams and DX men! Send in your pix. They are good fer a buck fer every one printed.





W9VSX uses one of the Lindberg UHF transmitters for his 30 MC. transmissions. Bill is a member of the Rag Chewer's Club.

W9DDD is organizing a "S.A.A.B. Club." The initial stand for "Save American Amateur Bands," and he wants to get in touch with any hams who are interested in getting full information on the hams bands. The purpose of the organization is to keep the bands as they are, and not have them changed. Why not get together with W9ISR and his "Vigilantes"?

By the bye, *what has* happened to "The Vigilantes"? Their purposes were good and their group wide awake.

W6PXK, wore himself out helping the unfortunates during the last L. A. holocaust. His rig did yeoman's job.

W1BDS won the Paley Amateur Award. His pix is on the page. Congrats, Wilson, on your receiving the "Oscar" of hamdom!

Winners in the Union County Amateur Radio Assn., Inc., were Garth G. Sheldon, Livingston, NJ—RME 70 Receiver; W2LMI—Sky-Buddy Receiver; Geo. L. Fuchs—Astatic Xtal Mike; Pat Tamare—Hallicrafter, No. 23 Receiver; W3GKK—RME 70 Receiver; B. Barghausen—Martin Flash Key. Congrats to this gang. We are told that they gave away $1200 (count 'em) worth of door and other prizes. The above was reported by W2CZS for the UCARA Hamfest Comm.

Adrian Blancquaert of Flanders, Belgium forwards the very interesting pix of ON4KD. Note the direction finder. We are told that these units are very common over there.

Using 40M as the medium, W5GKY, Winters, Tex. and W9VIL, Dodge City, Iowa, exchanged views on the eclipse of the sun on April 19th. W5GKY could not see the sun from his shack, and so moved his portable 15-watt rig out on top of his shack. From there the QSO lasted 2 hours and a full description was sent to W9VIL.

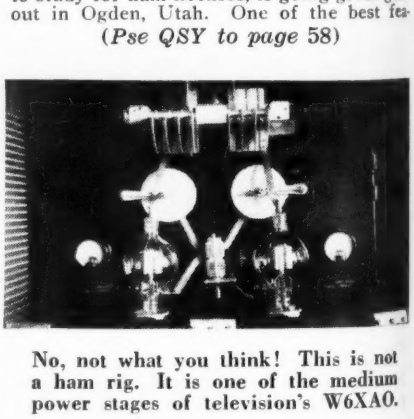
Who used a BB-gun to kill W5GKY's skywire the other a.m.? The dastardly deed was discovered when 5 replies to CQ's got no answer.

The "SRC Ham News" is one fb rag. Has lotsa dope and gossip of the extreme far West. They offer a valuable prize for cartoons.

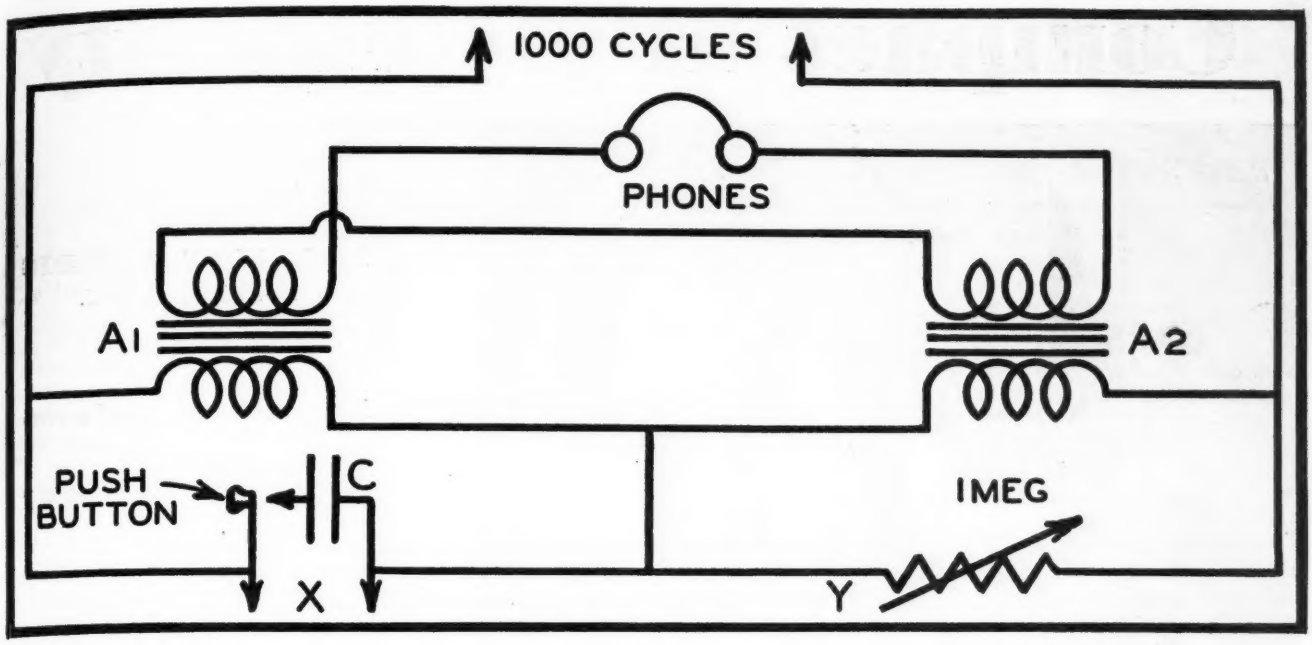
When W6EOU, Sacramento failed to operate his rig (½ kw. of Calif. Power) fer a double fortnight (oh, alright—make it a month) while out of town on business, the power companies sent an investigator out to check the wattmeter, wondering why the sudden decrease in consumption. A. W. Borgia, who sent the item in, fails to report what the result of the investigation was. *(Dear HC Ed. Borgia and W6EOU are the same person. Vy Trly yrs. Yr. Sec'y.)* Hmmmmmm!

A *CQ Radio Club*, organized Jan. 20, 1939, to study for ham licenses, is going great guns out in Ogden, Utah. One of the best fea-

(Pse QSY to page 58)



No, not what you think! This is not a ham rig. It is one of the medium power stages of television's W6XAO.



Audio Frequency Bridge

by CHAS. E. DIEHL, A.B., W6EVF
Toppenish, Washington

A cheap instrument which can be used to measure inductances and capacities and which should be in every service shop.

ABOVE is the circuit of a 1000 cycle bridge that is very sensitive and can be built from material that costs very little and which most experimenters have on hand. Input is from any audio oscillator that will produce a note in the vicinity of 1000 cycles.

Note the two identical audio transformers A_1 and A_2. Their primaries are in series across the 1000 cycles. Secondaries are hooked up bucking. As long as nothing disturbs the balance, no sound is heard in the phones. Both sides of the phones are at equal potential. With the one megohm volume control in circuit and a calibrated pointer on shaft that indicates percentage of the resistor in series, we have a fairly accurately known resistor. Any unknown resistor is inserted at X. An unbalance between the resistances X and Y will cause more current to flow in one audio channel than in the other. Result—sound in head phones. Now we vary Y until sound ceases, and the resistance of Y is equal to the resistance of the unknown X.

The bridge is equally satisfactory for measuring capacity and inductance. Calibration of Y is made in capacity by choosing several known capacities and substituting at X and balancing. The important part in balancing a pure resistance against the resistance of a condenser is that any subsequent measurements must be made with the identical audio frequency used to calibrate. To check this and enable a setting of the audio oscillator to the same frequency we have inserted condenser C as a permanent part of the equipment. This condenser is connected so the push button will insert it in place of X.

The value of C is any convenient value you have on hand. That is any value that will give a reading on Y that can be reset easily. For calibration the push button is pressed and balance obtained on Y. This point of balance is recorded. When using the bridge, first place Y at the recorded position, press button and obtain balance by *varying the input frequency until no sound is heard in phones.* The frequency will then be the same as the original calibration frequency.

Similarly inductances can be measured at X. Calibrate positions on Y with known values. The condenser push button must be used to check frequency of input at each time inductances are measured as well as capacities because both have a different resistance (impedance) at different frequencies. The higher the audio frequency, the smaller the capacities or inductances that can be measured. If so desired two calibrations can be made at different frequencies. A high audio frequency and a low audio frequency. This will make the ranges extend both ways. Also different variable resistors can be used at Y with a switching device that will insert the desired one in the circuit. It is possible to make this instrument do the jobs of several very expensive instruments with an accuracy sufficient for any experimenter. Such jobs as coil matching, capacity matching and filter choke efficiency tests can be made as well as resistance measurements.

The audio note source can be a regulation signal generator or it can be constructed from a single tube and an audio transformer. The disadvantage of the latter home-built type is that there is grave danger of getting a note which will be replete with harmonics, and which might vary in amplitude. With that type of note the measurements are very apt to be inaccurate, and the whole scheme fails. For quick checks, however, the home-built audio generator should work. —30—

Compact High Fidelity

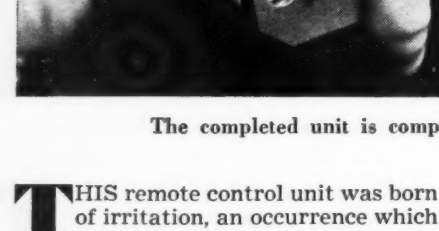
The completed unit is compact and very easy to construct.

by ERNEST A. ZADIG
New York City, N. Y.

For the comfort of arm-chair-control of your broadcast receiver, this unit will be just right.

THIS remote control unit was born of irritation, an occurrence which brings to mind the phenomenon of the oyster and its pearl. This comparison may be condoned because this little device is truly a "pearl" in compactness and performance. The irritation which started the design and construction was caused by the noisy, poor functioning of a commercial unit which originally was used.

It seems to be standard practice, in the building of accessory remote control devices, to control the volume at the distant receiver by reducing the amplitude of the carrier emanating from the remote unit. This method works when applied to old receivers not equipped with automatic volume control. In any AVC receiver, however, this method is far from satisfactory. It has the primary effect of increasing the background noise. Under these conditions, reduction in audio volume does not occur to any substantial extent until the carrier has become so weak that it has slipped below the ability of the AVC to hold up the output.



Power is drawn from the house mains.

In the remote control unit here described, the carrier wave sent from it to the receiver is of constant strength. It is unaffected by the position of the volume control. This holds the AVC of the receiver down and permits noise-free reception. It also permits the equivalent of turning the receiver off for short intervals from the remote point (as for instance when the telephone is to be answered) merely by rotating the remote volume control to zero.

This remote control unit is superior also by virtue of its oscillator circuit and the hookup for modulating it. A modulated oscillator is ordinarily difficult to hold onto the straight and narrow frequency path. The oscillator frequency "wobbulates" with the modulation and this in turn causes serious sideband cutting when a selective receiver is used for reception. The oscillator section of the present unit is practically equivalent to a buffer amplifier electron-coupled to the oscillator and this makes for excellent frequency stability with consequent high quality reception.

The high quality of reception is kept uniform at all volume levels by the modulation means employed. Changes in volume at the receiver are accomplished by changing the percentage modulation of the carrier sent to it by the remote unit. No distortion is therefore added when the audio volume is held down to a very low point.

Further quality insurance is had by virtue of the diode detection in the remote unit, and the resistance-coupled audio amplification. The fluctuating diode voltage is also used to provide automatic volume control over the radio frequency section of the first detector.

No actual intermediate frequency amplification is used in the remote control unit. The intermediate frequency transformer is there to provide the selectivity which is a feature of the superheterodyne circuit. It cannot amplify since no vacuum tube is associated with it.

The vacuum tube was omitted purely in the interest of compactness and because under ordinary conditions it is not really necessary. In locations where radio reception is very poor, this intermediate frequency amplifying tube may be added in the conventional manner.

Summed up from a technical standpoint, it will be noted that the remote control unit is a complete superheterodyne receiver (even including a second detector and audio amplifier) and also an electron-coupled transmitter. The process may be likened to a rebroadcast similar, for instance, to a regular broadcasting station picking up a program from Europe and then sending it out again on its own channel. In contrast, the standard type of remote control is merely a frequency converter whose intermediate frequency stage

Remote Receiver Control

is linked to the receiver by air. This explanation should make clear why the herein described unit is unique in being able to send out a constant strength carrier whose percentage of modulation is varied.

The remote control device is entirely self-contained and requires no connection whatever with the receiver; plugging it into an AC or DC outlet completes the job of hooking-up. The broadcast carriers are picked off the power line, making the usual hank of aerial wire unnecessary. (Under extremely poor conditions, a short length of aerial wire may be attached to the point marked "A" in the wiring diagram.) The output power is ample to insure excellent operation between any two points within the average home or apartment.

The frequency of the connecting link has been chosen as 1575 kilocycles. Conversation with the local radio inspector seems to indicate that this is a clear channel throughout the country. Furthermore, it is just a shade above the top of the broadcast band and therefore within the tuning ability of most radio receivers. Of course, this frequency may be changed to suit the whims of the individual builder; it could be placed within the short-wave spectrum if the receiver is so equipped. A caution to observe is to stay away from frequencies which are either within the broadcast band or whose harmonics fall within the broadcast band.

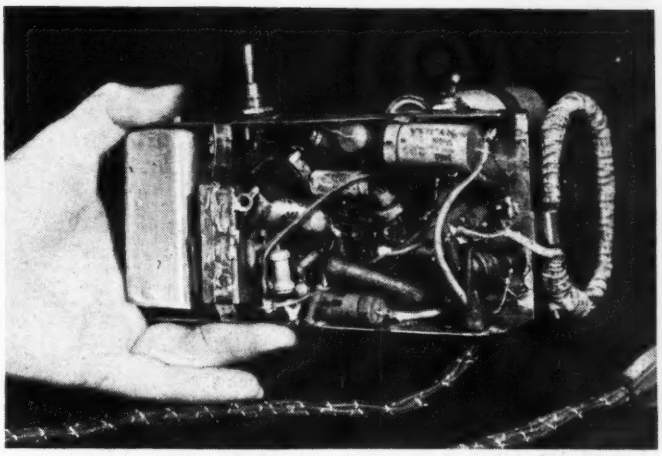
A feature of the construction is the loop shown in the illustrations. This is composed of twenty turns of No. 12 single cotton enamel wire wound to a rectangular shape three inches by four inches with a center tap from the tenth turn. The loop is then taped or bound to hold it solid. This loop acts both as the transmitting tank inductance and as the radiator. It has the usual loop directional characteristics which may prove handy under some conditions of interference. It is tuned by means of a standard 500 micromicrofarad padder condenser as shown.

The construction of this remote control unit is sufficiently easy to fall within the ken of any amateur soldering iron wielder. Exact layouts naturally depend upon the parts used, but the photographs are self-explanatory and should be generally followed.

The chassis is bent from a flat sheet of steel measuring 6¾ x 6½ inches. Two sides are bent down 1½ inches from the edge, making a chassis 6¾ x 3½ x 1½ inches. Socket, volume, control, switch, and other holes are cut as shown.

The oscillator coil for the 6A7 frequency converter is mounted in the bottom of the intermediate frequency transformer in order to save space. The axes of the oscillator coil and of the IF coils should be at right angles and they should be spaced as far apart as possible. Sufficient room will usually be found to place the padder condenser in the can also, for instance as shown in the illustration. Some parts dealers stock a unit of this combined type ready to use.

A small, two-gang variable condenser was utilized in the unit being described because it was thought desirable to be able to tune in any station in the broadcast band. This condenser could be omitted and a standard two-gang push-button switch substituted therefor. This would give automatic tuning for six or eight predetermined stations. It is also possible to fit a four-button tuner in the space above the variable and retain both.



The bound coil transmits the signal to the broadcast receiver. This is what tunes in the stations.

It is best to mount all parts on the chassis before commencing the hook-up and then to complete the filament circuit first. The voltage drop needed for the present tube complement is obtained from a line cord resistor of 200 ohms. The sequence of filaments from line cord to ground is shown in the diagram. The "ground" is the chassis; this makes what is commonly known as a "hot" chassis but is general practice in midget receivers and will do no harm since the unit will doubtless be encased in a small cabinet or box.

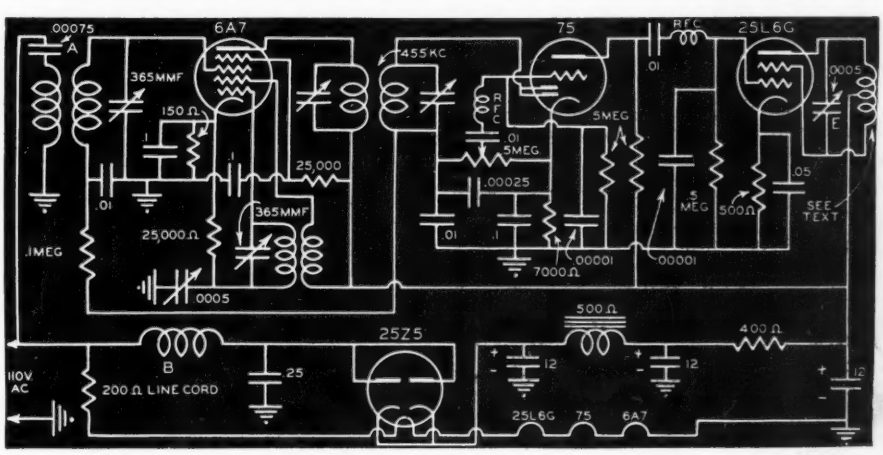
One of the most important prerequisites for high fidelity operation is a hum-free power supply. By actual measurement, the percentage ripple in this remote unit is only .19%, a good figure.

The filter is a two section *pi*, an inductance (choke coil) being used in the first section and a resistance in the second. The choke is of five hundred ohms resistance of the type commonly used in midgets. The resistance is 400 ohms, 2 watts. The condensers are 12 mfd. electrolytics of 200 volts rating. Three of the slender cartridge type were used and bound together into one unit for easy mounting. The .25 mfd. paper condenser from the rectifier plates to the chassis is important; it's a ten-to-one shot that any serious hum is traceable to its defect or omission.

The radio frequency choke marked "B" in the diagram is also important. It provides the impedance to signals in the broadcast band which makes it possible to use the power line for an antenna. One of the two coils in an old intermediate frequency transformer was made to serve as this choke. It was of the type wound in four sections on an impregnated tube. The .00075 mfd. fixed condenser which connects it with the primary of the r.f. transformer should be of a good grade mica because the line voltage is impressed across it.

The intermediate frequency transformer is operated at 455 kilocycles and the oscillator coil is chosen accordingly. Radio frequency choke coils and

(*Tune in further on page* 45)



TECHNICAL BOOK & BULLETIN REVIEW

AERONAUTIC RADIO, by Myron F. Eddy, Lieutenant U. S. Navy, retired, published by the Ronald Press Company of New York City, covers all of the various fields of radio as it applies to the aviation industry. This book makes a very valuable source of information available for the radio operator or service engineer and contains many chapters on modern circuits and applications. Many illustrations are given together with large and distinct schematic diagrams so that the student will have little difficulty in making his analysis of the circuit. Chapters include: Aviation-radio communications, Fundamentals of Electricity, Radio Electricity, Circuits, Tubes, Batteries, Power Supplies, Radio Telegraph Transmitters, Beacons, Receivers, Direction Finders, Landing Systems, Traffic Control, Installation, Maintenance, Graphical Symbols, Definitions of Terms Used in Radio Engineering. Mr. Eddy is Chief Instructor in Aircraft Radio at Stewart Technical School and is a member of the Institute of Radio Engineers. This excellent book contains 502 pages together with many illustrations and is a valuable addition to any radio library.

PRINCIPLES AND PRACTICE OF RADIO SERVICING, written by H. J. Hicks, M.S., Radio Instructor at Hadley Vocational School in St. Louis. This first edition published by the McGraw-Hill Book Co., Inc., gives the radio serviceman a source of information concerning the various problems encountered in the daily routine of servicing modern receivers. The information contained covers all of the various automatic features such as are found today, including the automatic volume control, etc. Beginning with an introduction, the various chapters of the book take the reader to each and every part of circuit analysis and chapters are included on the Fundamentals of Magnetism and Electricity, Fundamentals of Radio, Radio Tubes, Test Equipment, Theory of R. F. Amplifiers, Theory of A. F. Amplifiers, Power Supplies, Detection or Demodulation, Volume, Tone and Frequency Control, Loud Speakers, Antennae and the Elimination of Man-made Static, Superheterodynes, Servicing Radio Receivers, Public-Address Systems, and two very valuable chapters on the Business Side of Radio Servicing and a large appendix which contains many charts and formulae. This book contains 305 pages devoted completely to problems in radio servicing.

TELEVISION, published by Radio Corporation of America, Radio City, New York, is a small booklet available to radio listeners interested in this new and fascinating art. Explains in simple language the fundamental principles of Television. A questionnaire is included which contains general questions pertaining to Television together with answers to the questions. Many illustrations afford an opportunity for the reader to become acquainted with the latest in Television equipment. Explanations are given as to what the viewer may expect from the latest in receivers. A questionnaire is also included on questions pertaining to the Television program itself. Copies of the above booklet may be obtained by writing to R.C.A., Radio City, New York.

SPRAYBERRY DICTIONARY OF RADIO, written by F. L. Sprayberry—Instructor in Radio—contains 94 pages devoted to the listing of all terms used in radio work. This excellent book also contains several interesting charts and a table of db levels, a resistor wattage chart, an explanation of the most common cases in receiver failure and a parallel resistor chart, together with charts on Greek symbols used in radio, vacuum tubes and decimal equivalents, etc. This booklet will find use as a handy reference for the up-to-date serviceman or radio engineer as it gives direct answers to phrases not often used in radio.

-30-

By JERRY COLBY

WELL, the Feds are a-comin' and it ain't around the mountain. They've already arrived and plenty of scalps are hanging from their belts. Scalps of ops like Thomas Carpender of St. Paul, Minnesota, who pleaded guilty to an indictment charging the operation of an unlicensed radio station in violation of Sections 301 and 318 of the *ComAct of 1934*. The mercy of the court placed him on probation for two years. *RI's* of the *FCC* say they suspect many other unlicensed stations are operating around St. Paul area. So beware, beware. . . .

DOC DAVENPORT was reminiscing the other day and he says that back in '18 they hung up some records which are still standing intact. For one thing, not missing a time signal during the entire trip across the Atlantic; putting out only 3 amps with a one-half KW arc and stretching the signal 1750 miles . . . and during daylight hours at that! And even if the equipment was not of the best, if any skeds with *KSF* were missed during the entire trip between Sydney, Australia, and the states, the operator was automatically fired upon his return. And all this was done on a hunk of crystal and a cats whisker! Can you imagine what they'd have done with a tube job? Yep, those were the days of iron ships and tall tales!

IT is with a deep feeling of sorrow and the knowledge of a great loss to the radio operating profession that we learned of the death of Stephen Kovacs. He passed away at the U. S. Marine Hospital, Key West, Florida. Our sincere and heartfelt wishes for smooth sailing and clear skies with the Great Pilot. At least now he will have surcease from his continual fight for radiop recognition and better working conditions!

THE Auto-Alarm boogie man continues to haunt radiops. The *FCC* engineering department states that "a further study of autoalarms with respect to their ability to respond to an alarm signal while being subjected to interfering signals and/or atmospherics." But credit is given to the autoalarm in the rescue of the ten survivors of the ill-fated British Flying Boat *Cavalier* by the *Esso-Baytown*. The *Esso-Baytown's* radiop was aroused from his labors elsewhere about the ship by the autoalarm. The alarm signal was sent by coastal station *WSL*. So there you are!

AT this time we extend congratulations to the *CTU-MARDIV*, its officers and members, on their second anniversary. It is a sincere pleasure to observe a group of radiops who had an ideal and stuck to it through hell and highwater. We wonder does any one realize what courage it takes to face a seemingly unsurmountable wall; odds that stronger men dared not invite to battle? Yet men like Louis J. Kleinklaus, Athan Cosmas, Freddy Ulrich, Karl Baarslag, Schatt and others ventured into rough mountainous seas with a craft that was built on an almost God-like faith in their ideals. And it was truly a question of struggling to success or drowning entirely without a trace of their past existence. Even their enemies must admire the grit and stamina that caused these radiops to stick to their post, their ideal, until success was assured. And their record to date is one of continuous progress and harmonious living with all radiops. Ye ed has always been for any organization which sincerely tries to better radiop conditions and which uses each man's membership card as a sacred trust for their individual benefit, which eventually results in benefiting every one. May The *CTU-MARDIV* live long and continue to prosper in its fight to help radiops gain greater recognition.

IT'S beginning to pay being a columnist for a gang of hardboiled radiops. Yowsah, friends and countrymen, in our many, many years of pounding out this monthly hash and rehash for the perusal of all and sundry, we have received large bundles of mail. But never an epistle from the weaker??? sex. So it was an extra-special day when we opened a fan letter signed by a YL! And she remarks as how the column is okay (thank you) but why not place a photo of A. B. Krueger in our thumbnail sketches of pioneers in radio? How come or why, asks we? Let's hear from those who know Kreuger now or knew him when . . .

NOW we know why many ops refuse to have their names or photos published. Because if Don Hekking ever owed any one money, he'd sure have to pay up now. At least a dozen letters from all over the country came to our desk with various addresses for him. And now the latest one from V. R. Lewis of the *RMCA* office in Cleveland, tells us he can be located at 1309 Carr Street, Sandusky, Ohio. Thank you, V. R. Which goes to prove we all come together in this column, somehow.

HERE'S a dandy set up for a few radiops with the ability and knowledge of erecting, installing, equipping and maintaining a police radio station for a city of eight to ten thousand souls. Our information comes from a young "Ham" who has the inside track with the Mayor, and the politicos are getting into a huddle about its cost and general possibilities. So if any of youse guys and gals want a nice shore-side billet, send in your appliques and I'll put you in touch with said young Ham.

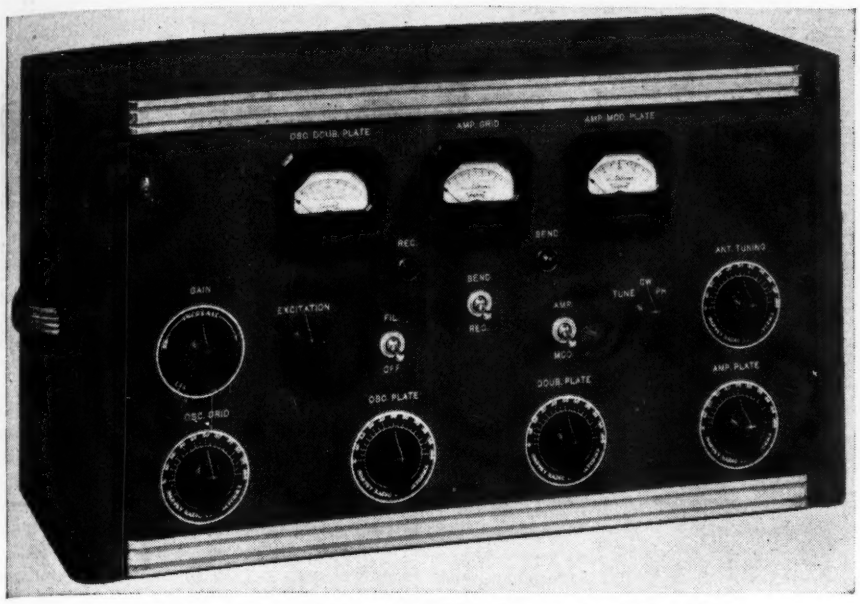
GG requests particular information about Harry Chetham who was last heard from as the Police Radio chief in Somerville, Massachusetts. This colyumnist recalls some of the fireworks that HC caused in that same town when he passed the examinations with a mark of 100 percent. The Mayor wanted to place one of his henchmen into the Chief's billet, so he had HC declared physically incompetent. But Harry went to bat and held the job down for quite a few years. So if HC is on topside, shoot us a line.

FROM the mailbag: Dear GY: In spite of the fact that I am in the telegraph branch of the radio industry, my primary and main interest in radio is receiver design and construction. . . . I should like to know if you have any information concerning possibilities and availability on positions in broadcast. I have experience in this field and hold a 1st class phone and telegraph ticket. I do not care for key work as recvr and phone experimental work and construction are more interesting. R. J. Ans.: Why not make up a good letter and send it to every concern who manufactures and designs new recvr equipment for marine phone apparatus? Any local *RCA* office will give you the names of the various manufacturers of this equipment.

DEAR COLBY: Your article in March issue RADIO NEWS very good. (*Tnx*) I am a radio ham—been one for 4 years and

(*More QRD? on page* 45)

Portable 50-watt Xmtr.



Accessibility of controls is a desirable point in designing this rig.

by G. L. DANFORTH
Engineering Dept.
Harvey Radio Labs., Inc.
Cambridge, Mass.

Nine different features are included in this versatile 50-watt portable xmtr.

☆

TRANSMITTER design is usually a compromise between the factors of cost, power and layout. No two operators, of course, will be in complete accord as to which features are necessary to a transmitter, but here is one idea of what the low-powered unit should feature:—

6 Band Operation
Phone and CW Operation
Crystal Microphone Input
Universal Antenna Coupler
Crystal and Electron-coupled Oscillator
Small Size for Portability
Use as Transmitter or Exciter

We chose an input power of 50 watts because, with a reasonably good antenna, 50 watts will get out in good shape, and the cost of such a transmitter is within the reach of most "hams."

To meet the trend towards greater flexibility, circuits are arranged so that modulator output can be used to drive a high-powered audio stage and the r.f. output easily coupled to a kilowatt class C amplifier. In this way, the unit serves a dual purpose—complete transmitter or exciter.

Referring to the schematic wiring diagram it will be seen that the r.f. tube line-up consists of a 6L6 crystal or electron-coupled oscillator, 6L6 buffer-doubler, and 807 final. The AF tube line-up uses a 6J7 fed by a crystal microphone, a 6C8G duo-triode as a second stage of AF and phase inverter, and a pair of 6L6G's in Class AB as modulators.

The 6L6 crystal stage may be connected as a straight pentode oscillator, as a tritet oscillator, or as an electron-coupled oscillator. When used in the straight pentode circuit, with crystals from 160 to 40 meters, a shorting plug is placed in coil socket "A" which grounds one side of the crystal and the cathode bias resistor and bypass R_1-C_2, shorts the tritet grid condenser C_1, and inserts a slight grid-to-plate capacity to provide stronger oscillation for the higher frequency crystals. Experience has shown that the specified size of capacity does not increase the crystal current with the 6L6 tube, at least, enough to endanger the crystal.

With crystal control, the oscillator is normally used in the straight pentode circuit for 160, 80, and 40 meters. For output frequencies above 7 megacycles, harmonics of the 40 meter crystal are used. For 20 meter output then, the oscillator is tritet connected (accomplished by removing the shorting plug from the oscillator grid circuit and substituting the proper grid coil), doubling in the oscillator plate to 20 meters. The buffer acts only as an amplifier, exciting the 807 on 20. For 10 meter output the oscillator doubles from 40 to 20 as before while the buffer doubles to 10. For 5 meter output the oscillator plate is tuned to the fourth harmonic of the crystal—10 meters—and the buffer doubles to 5. The 807 does no doubling at any time, making for increased efficiency and higher output.

When using the oscillator in the electron-coupled circuit, a mica condenser, about 100 mmf., is plugged into the crystal socket, a tapped inductance into coil socket "A," and the circuit tuned in the usual manner.

It will be noted that a combination of grid-leak and cathode bias is used. This provides the best form of bias for quick starting of the crystal and low plate current when the oscillator plate circuit is detuned.

The 6L6 buffer-doubler stage needs no neutralization when doubling, although it *does* when amplifying on the same frequency. To save connecting and disconnecting the neutralizing condenser, the grid end is wired to one of the blank pins of the coil socket. Oscillator plate coils used in a non-doubling buffer set-up, employ a jumper from the B plus end of the coil to the neutralizing condenser pin. For coils involving doubling of the buffer there is, of course, no jumper. This arrangement insures that the neutralizing condenser is always connected when needed and disconnected when not needed. The condenser is a small ceramic insulated padder, 3 mmfd. to 35 mmfd. This is set to neutralize the circuit and then sealed with some beeswax melted on with a soldering iron to insure permanency of setting. We have found that 6L6's are sufficiently uniform in their inter-element capacities so that they may be interchanged without upsetting the neutralization.

The coils are of the usual sizes and need no special comment except that the 160 meter coils require padding condensers mounted inside, 100 mfd. condensers for the oscillator and buffer plate coils, and a 25 mfd. condenser for the 807 plate coil.

There is an excitation control in the buffer screen circuit. On the lower frequencies the screen voltage will have to be lowered in order to adjust the final grid current to the proper value, 3 to 5 mils. Overdriving the grid will result in decreased output.

Both the oscillator and doubler plate currents are measured by one instrument.

The 807 final stage is keyed in the cathode circuit. Keying here, rather than in the oscillator, makes for stability of frequency and removes the

possibility of chirps from the signal. There is a switching circuit wired so that one instrument will measure either final plate current or the modulator plate current. This switching arrangement enables all circuits to be metered without using too many instruments and also avoids the unsightly, and often dangerous, plug-and-jack system of making one instrument read all circuits.

The universal antenna coupler is probably the most novel feature of the unit. The switching system uses what is, effectively, four 5-point shorting switches to connect a 140 mmfd. variable condenser for series tuning of the antenna, for parallel tuning, or, with the variable condenser connected, for parallel tuning fixed capacities of 100, 200, or 300 mmfds. in parallel with it.

This allows the unit to be coupled to any high or low impedance feeder within its frequency range. For low impedance feeders, such as, coaxial line, twisted pair line, or when working into a single wire ¼ wave antenna against ground, the series position should be used. A half-wave antenna may be end fed from the parallel-tuned antenna circuit and may be used with or without the ground.

The antenna switch used is specially constructed and very compact. It is mounted on the back of the panel vertically with its knob inside the cabinet. As it does not have to be adjusted with the transmitter in operation, this is a good location for it. The knob of the antenna tuning condenser is brought out the front of the panel.

The a.f. section of the unit is quite conventional except for the feature of the terminal strip from which the output of the modulator may be fed to a high power Class B modulator to a loud speaker, or "what have you." For modulating the 807, the terminals 1-2, and 4-5 are jumped. Terminal No. 3 is the plus B return, for use only when an external transformer feeds the a.f. off to some other apparatus.

The power supply is designed as a separate unit and consists of a 300 volt supply with an 80 rectifier for the speech amplifier and exciter stages, and a 500 volt supply with an RK-60 (which is an oversized 5Z3 with the plate leads brought out of the top). Both of these supplies use the same power transformer, with taps for the low voltage supply. This arrangement is more compact and handier than using two separate transformers, although a special transformer is required.

Adequate bleeders are provided to drain off the charge of the filter condensers when the transmitter is shut down, insuring against possibility of shocks from a supposedly "dead" supply, as well as to improve the regulation.

As the power supply is on a separate chassis of its own, there is an eight-wire cable between the two units, connected by means of Jones plugs. This arrangement makes it possible to put the r.f. and a.f. unit right on the operating table, if desired, where it takes up little room, while the power supply may be placed under the table or in some other location where it is out of the way. For mobile use, where 110 volt a.c. is not available, a power supply may be made consisting of two genemotor units and associated relays and filters. This unit makes an excellent mobile installation.

When starting the transmitter, the "Filament" switch is first thrown. This sends current through the filament transformer T. The green pilot should light. After the tubes are hot, with the Tune-CW-PH switch in the "Tune" position, the "Send-Receive" switch is thrown to the "Send" position, energizing relay Re_1 and throwing on the low power supply. The exciter stages are then tuned in the usual manner for minimum dip of the Oscillator-Doubler Plate meter. The grid current of the 807 is adjusted by

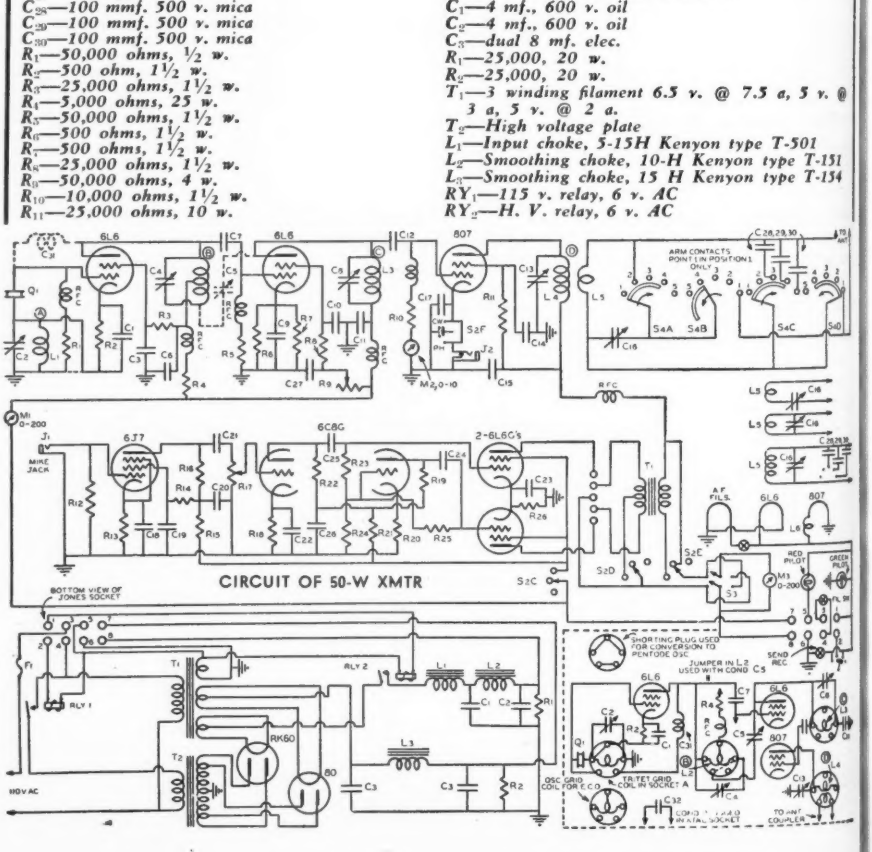
(*Pse QSY to page* 54)

An easy-to-get-at arrangement of parts.

C_1—.01 mfd. 400 v. paper
C_2—140 mmf.
C_3—.002 mfd. 500 v. mica
C_4—50 mmf.
C_5—10 mmf.
C_6—.002 mfd. 500 v. mica
C_7—.00005 mfd. 500 v. mica
C_8—50 mmf.
C_9—.01 mfd. 400 v. paper
C_{10}—.002 mfd. 500 v. mica
C_{11}—.002 mfd. 500 v. mica
C_{12}—.00005 mfd. 500 v. mica
C_{13}—50 mmfd.
C_{14}—.002 mfd. 500 v. mica
C_{15}—.002 mfd. 1000 v. mica
C_{16}—75 mmfd.
C_{17}—.01 mfd. 1000 v. mica
C_{18}—10 mfd. 25 v. electrol.
C_{19}—.05 mfd. 400 v. paper
C_{20}—.5 mfd. 400 v. paper
C_{21}—.01 mfd. 400 v. paper
C_{22}—10 mfd. 25 v. electrol.
C_{23}—25 mfd. 50 v. electrol.
C_{24}—.01 mfd. 400 v. paper
C_{25}—.01 mfd. 400 v. paper
C_{26}—8 mfd. 350 v. electrol.
C_{27}—.01 mfd. 500 v. mica
C_{28}—100 mmf. 500 v. mica
C_{29}—100 mmf. 500 v. mica
C_{30}—100 mmf. 500 v. mica
R_1—50,000 ohms, ½ w.
R_2—500 ohm, 1½ w.
R_3—25,000 ohms, 1½ w.
R_4—5,000 ohms, 25 w.
R_5—50,000 ohms, 1½ w.
R_6—500 ohms, 1½ w.
R_7—500 ohms, 1½ w.
R_8—25,000 ohms, 1½ w.
R_9—50,000 ohms, 4 w.
R_{10}—10,000 ohms, 1½ w.
R_{11}—25,000 ohms, 10 w.
R_{12}—500,000 ohms, ½ w.
R_{13}—5,000 ohms, ½ w.
R_{14}—1 meg., ½ w.
R_{15}—75,000 ohms, ½ w.
R_{16}—500,000 ohms, ½ w.
R_{17}—100,000 ohms, variable
R_{18}—2,000 ohms, ½ w.
R_{19}—100,000 ohms, ½ w.
R_{20}—2,000 ohms, ½ w.
R_{21}—10,000 ohms, 1½ w.
R_{22}—100,000 ohms, ½ w.
R_{23}—100,000 ohms, ½ w.
R_{24}—5,000 ohms, ½ w.
R_{25}—100,000 ohms, ½ w.
R_{26}—200 ohms, 10 w.
RFC_1—2.5 mh. choke
RFC_2—2.5 mh. choke
RFC_3—2.5 mh. choke
RFC_4—2.5 mh. choke
RFC_5—2.5 mh. choke
RFC_6—2.2 mh. choke
M_1—0-200 ma. } D.C.
M_2—0-10 ma. } Milliam-
M_3—0-200 ma. } meters
T_1—Modulation; Kenyon T-454

POWER SUPPLY

C_1—4 mf., 600 v. oil
C_2—4 mf., 600 v. oil
C_3—dual 8 mf. elec.
R_1—25,000, 20 w.
R_2—25,000, 20 w.
T_1—3 winding filament 6.5 v. @ 7.5 a, 5 v. @ 3 a, 5 v. @ 2 a.
T_2—High voltage plate
L_1—Input choke, 5-15H Kenyon type T-501
L_2—Smoothing choke, 10-H Kenyon type T-151
L_3—Smoothing choke, 15 H Kenyon type T-154
RY_1—115 v. relay, 6 v. AC
RY_2—H. V. relay, 6 v. AC



3 Necessities of Service Work

by ESTEN MOEN
Fosston, Minn.

In presenting the three very practical and excellent suggestions, the author has solved some vexing service problems.

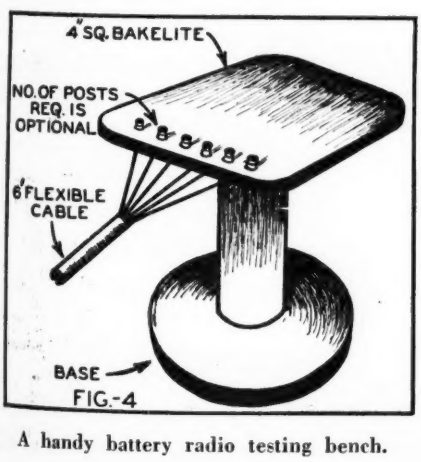
JUST ten years back a fellow could not make a living (professionally) in simply repairing radios: today, the marvel is that one certainly can do that. The art, newborn say, "overnight," of being a *Radio Doctor* (one who cures radios of "diseases") is indeed as dignified today as that of butcher, baker, jeweler, etc. There is one or more such a fellow in every hamlet in the land—a man who "knows his stuff" so well that the trail is well beaten up to his door.

Such servicemen (including myself) are not "getting very rich," perhaps because we fail in branching out into the commercial end of handling merchandise as well as repairing it, but how can all such voluminous tasks be loaded on the back of a single man? The answer is it cannot. He who knows only how to "doctor" radios must be satisfied in knowing little more. But we can look in another direction, and ask, how well equipped are our little laboratories? We can not buy all things we need from wholesale houses, rather we have to invent and improvise and organize as we go along.

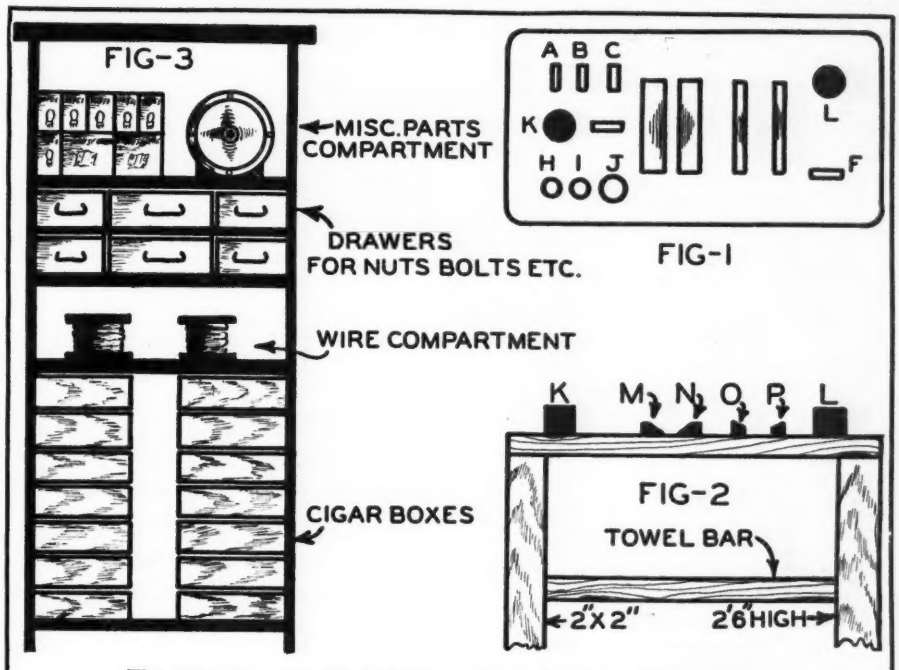
There is one big item that we professional servicemen must agree stands like a shadow to blight our prospects, and that is the sly, surreptitious suspicion in the mind of the customer who thinks he is getting swindled. If we pack our bags and make a trip in the country, for example, and we do an "operation" right in the parlor, consuming half an hour of time, then perhaps the radio-owner remarks that such an easy job was worth scarce fifty cents, much less a dollar. Instead of that, if the customer had brought his set to the shop where it could be "put to bed" for no more than three days' time, then how much more dignified would not this procedure be? Especially when the laboratory contains more equipment than could be freighted inside a big truck?

I know I have given the right answer above, and I can think back upon many a time when, in obliging a deep-country customer by nearly ruining my electric soldering iron, heating it red-hot on his kitchen stove, and many other trivialities of the same nature. I speak the truth when I say that we servicemen must stock up our shops because by doing so, then we are doing the square and fair thing by ourselves and others.

It takes years and years to make a "radio doctor" — no study course or short-cut can ever replace the vast experience that is required to operate a repair shop competently. A study course lays only the foundation upon which rich experience can be built.



A handy battery radio testing bench.



This "Serviceman's High-Boy" can keep the shop clear of gear.

WE begin with pawing over a table on which lies the radio set to be repaired. Outside of this "operating" table we have perhaps a toolbag or brief case in which to throw the tools. Has anyone ever thought of gracing the room with a "tool tabouret"? Here is my gadget which it took me years to learn how to assemble. The legs of the stand are two pieces of 2"x2", standing 2'6" high; on top is an inch-thick rectangle of pine, about 6"x12"; slots A, B, C and D are drilled and sawed out. They are used for files of various sizes. Slot E holds a knife, while slot F holds a pair of pliers. Slots G, H, I and J are holes in which various screw-drivers are thrust, handles up, always. A round, tapering off-set plug (K) will hold a roll of tape, and a similar plug, L, a roll of solder. Some long and narrow slots, O and P, form a gap in which to lay wrenches. Similar but bigger, and sloping slats, M and N, form a groove on which to lay the solder-iron.

The figure shows part of the stand beneath. About a foot lower under the top, horizontally, is nailed in a round dowel or square bar on which to hang cloths. You know, I've had the experience of fraying my good trousers, of dropping hot solder on them, until I learned to use a lap-cloth or protective apron. It is just a piece of white duck, cut from an old

(*Service further on page* 54)

SIGHT & SOUND NEWS

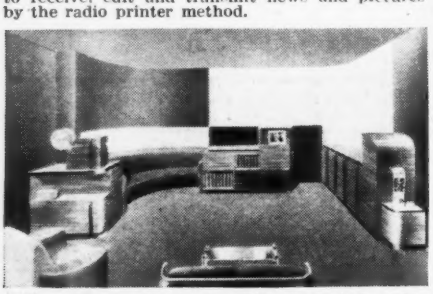
FACSIMILE DEMONSTRATED TO PHILLY POLICE

PHILADELPHIA, Pa., (Special to RADIO NEWS): During Radio Open House Week, a daily demonstration of facsimile broadcasting was given for visitors at Station WCAU. Programs emanated from the RCA Station at Camden, New Jersey.

Facsimile transmission was made in conjunction with the Philadelphia Police Department to demonstrate possible police usage, especially for criminal identification.

NEW YORK WORLD'S FAIR FACSIMILE DISPLAY

NEW YORK, N. Y., (Special to RADIO NEWS): Facsimile's possibilities as a news dispensing medium were emphasized in an elaborate RCA display at the New York World's Fair. The display includes a model newspaper office designed to receive, edit and transmit news and pictures by the radio printer method.



News is brought to the Editor's desk by teletype. After copyreading, the pages are typed in page form on a varityper machine and placed in the scanner for transmitting. Provision is made to make still photographs from a near-by television receiver screen and these are transmitted via facsimile process.

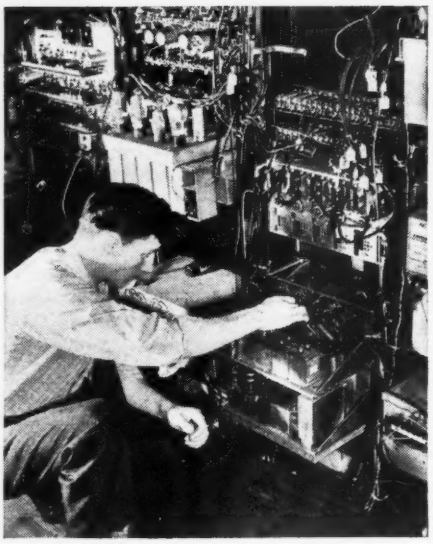
AP MEMBERS WITNESS SPECIAL TELECAST

NEW YORK, N. Y. (Special to RADIO NEWS): At the Annual Meeting of the Associated Press, members witnessed a special telecast over NBCs W2XBS. More than 300 editors and publishers viewed the combination film and live talent show received on a battery of RCA receivers in the Grand Ballroom of the Waldorf Astoria. Part of the program was picked up by the mobile television unit located in the AP news room in Rockefeller Center.

STROMBERG-CARLSON DEVELOPS PORTABLE TELEPHONE SYSTEM

ROCHESTER, N. Y.: Stromberg-Carlson has designed a new portable telephone system primarily designed as an aid in installing television receivers. With this system, installation

men can communicate with each other, at the same time leaving their hands free for work.



Testing the rack of amplifiers for television in the RCA research labs.

This system is particularly applicable for the installation of antennae.

The system includes two breast plate transmitters, two headset receivers, and 200 feet of rubber covered cord. The kit weighs 8 lbs.

CROSLEY RADIO CORPORATION STANDING BY FOR TELEVISION

CINCINNATI, Ohio: Officials of the Crosley Radio Corporation today stated: "It is the opinion of the company that television is an unknown factor and in order to be prepared for any eventuality it is our intention to keep abreast of all phases of the new science by research and development in transmitting and receiving equipment and training personnel both in the engineering and programming branches of the new art. As yet no plans have been formulated for broadcasting television programs.

"While our factory has already constructed a number of television receivers in its laboratory, no schedules have been made for their production. Neither have approximate retail costs been determined, nor have any plans for marketing the receivers been decided upon.

"If it develops that television is moving into public acceptance, The Crosley Corporation has prepared itself to help lead the way, both in the building and transmission of suitable television programs by a trained staff and in engineering, design and production of television receiving equipment in quantity numbers at popular prices."

BAIRD TELEVISION TO MAKE BROADWAY, NEW YORK BOW

NEW YORK, N. Y.: The Baird Television Corporation of London, England, is considering the installation of several television projectors in various Broadway theaters. Arthur A. Lee, Vice-president of Gaumont-British in this country, predicts that by May 15 Broadway will have had its first television theater. In England, Gaumont will have completed the equipment in 150 theaters by May 1st. Broadway theaters will be equipped with screens 12' x 15' in size.

A. N. P. A. CONVENTION ATTENDS FACSIMILE DEMONSTRATION

NEW YORK, N. Y. (Special to RADIO NEWS): The Convention of the American Newspaper Publishers Association, held at the Waldorf Astoria, witnessed a special demonstration of radio facsimile during which actual pages of the paper issued by the "St. Louis Post Dispatch" were transmitted. Harold C. Vance, manager of RCA Victor facsimile sales, supervised the display.

NEW VICTORIA THEATER EQUIPPED WITH BAIRD TELEVISION

LONDON, England: The big Gaumont-British New Victoria Theater in London has been equipped with the world's largest television screen, which measures 20' x 15'. This is larger by 8 feet than previous screens.

Engineers working day and night made many other installations in London theaters before the telecast of the Derby at Epsom Downs on May 24th. Twelve theaters were so equipped.

TELEGLAMOUR GIRLS NEED PERSONALITY—NOT HAIR

NEW YORK, N. Y.: Thomas H. Hutchinson, NBC's Director of Television Programs says that he will welcome all girls—blondes, red-heads and brunettes—providing that they have personality. Dead-pan "Miss Americas" won't have a ghost of a chance in competition with a lovely vivacious, but far less beautiful, girl. In picking out suitable feminine television talent, Mr. Hutchinson has at once a pleasant but difficult job.

EXPERIMENTAL TESTS ON COAX CABLE GOING ON BETWEEN N. Y. AND PHILLY

WASHINGTON, D. C.: The Federal Communications Commission reports that tests are in progress on the experimental coaxial cable installation between New York and Philadelphia and that they have demonstrated the feasibility of transmitting 480 simultaneous telephone conversations through this single small cable.

The cable is especially adaptable for the line transmission of television programs and any one of the 480 telephone channels may be used for facsimile or wirephoto as well.

Five thousand telegrams simultaneously may be transmitted over this same coaxial cable, it was pointed out. The connection is 94.5 miles long and was completed late in 1938. The system is operated under authorization granted to the American Telephone & Telegraph Company and the extensive program of field tests and experiments has been carried out by the Bell Labs.

A similar system is being considered for installation between Stevens Point, Wisconsin, and Minneapolis, Minnesota,—a distance of 195 miles.

TELEVISION MAKES DEBUT AT SAN FRANCISCO FAIR

SAN FRANCISCO, California: Visitors to the Golden Gate Exposition will not only see practicable home television demonstrated, but will themselves have an opportunity to be televised, according to RCA.

RCA has erected a large building, with over 5000 square feet of space, on the Exposition grounds to house the television studio and viewing room. Radio facsimile, which will print news bulletins, pictures and other text in the home, will also be shown in addition to displays representative of every phase of the radio art.

TELEVISION SERVICE ABROAD REVEALED

NEW YORK, N. Y.: The International Telephone and Telegraph Corporation has released figures on television service, for the year 1938, abroad.

Great Britain, France and Germany all adopted positive modulation and uniformity of synchronizing signals. The number of lines used, however, differs: 405 in Great Britain; 455 in France; and 441 in Germany. Italy is believed to be following the German practice.

In France, the Eiffel Tower vision transmitter, ordered by the French P.T.T. from Le Ma

teriel Telephonique, associated company in France of the International Telephone and Telegraph Corporation, was inaugurated by the P.T.T. Minister in April. Thereafter, regular broadcasting has taken place about two hours daily, five days a week, of studio and film transmissions.

A four hour daily service is being furnished by the British Broadcasting Corporation, and Great Britain is at present (January, 1939) the only country in the world with regular commercial television service.

The output power was raised to 30 kw. and a new antenna placed in service at the end of 1938. Good reception has been reported all around Paris and also on the south coast of England. The quality of the pictures compares favorably with those from other transmitters in operation.

TELEVISION USES 648 TUBES

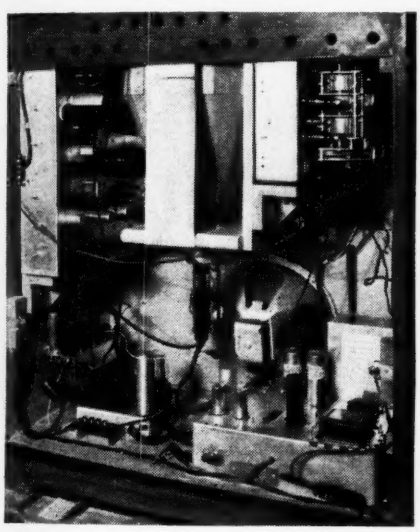
SCHENECTADY, New York: According to C. A. Priest, General Electric radio engineer, his company's television station scheduled to go into operation this year will have a total of 648 vacuum tubes. "Failure of any one of about 400 of the 648 tubes will stop the broadcast of the television program," Mr. Priest said.

This number of tubes is almost seven times the number used in the average radio broadcasting station of today. Station WGY, for instance, uses only 94 tubes to bring you your programs.

The Helderberg Hills station, concerning which Mr. Priest spoke, will serve the area comprising Schenectady, Albany, Troy, Amsterdam, and Saratoga, with a combined population of more than 500,000.

TELEVISION RECEIVERS SHOWN AT ANNUAL SALES CONFAB

ROCHESTER, N. Y.: Stromberg-Carlson distributors got their first glimpse of the company's new television receivers at the Annual Sales Convention held during May. Lee McCanne, Radio Sales Manager, said: "It has always been our policy to thoroughly test every Stromberg-Carlson product under actual service conditions before placing it on the market. These tests have demonstrated that the company's receivers will function perfectly on the standard television channels."



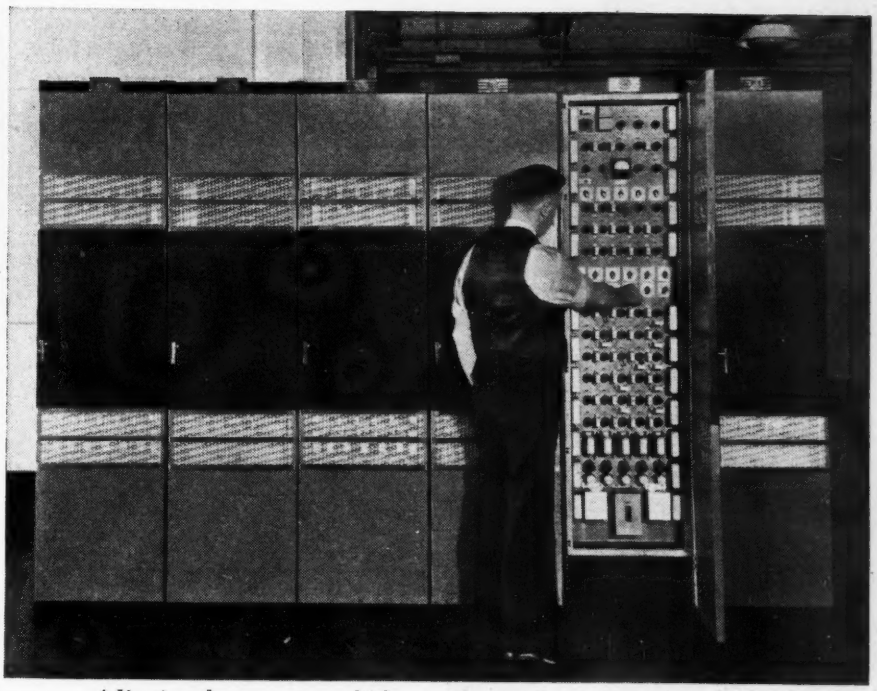
Rear view of an RCA-Victor home television receiver. C-R tube is vertical.

BELMONT RADIO DEVELOPS TELEVISION RECEIVER

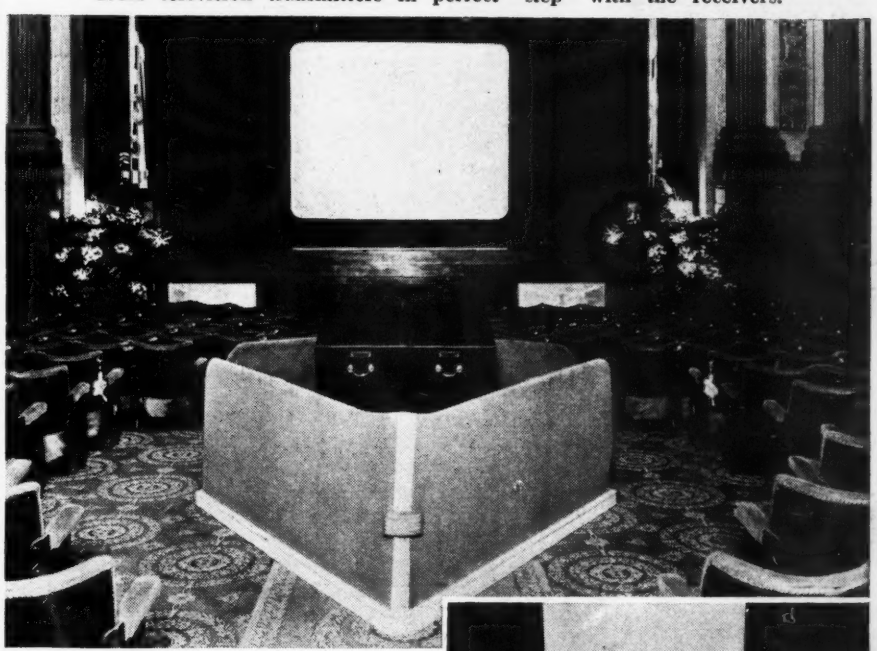
CHICAGO, Illinois: A television receiver will be offered to the public just as soon as conditions warrant, P. S. Billings, president of Belmont Radio Corporation, announced today.

GRADUATES RECEIVE DIPLOMAS BY TELEVISION

BOSTON, Mass.: Unique graduation exercises, in which the graduates received their diplomas by television, were held at the Massachusetts Television Institute on April 15th, when the Institute graduated its first class of television engineers. The "image" was 9" x 12", sharp and clear. President Porter H. Evans presented the diplomas to ten young men, while Prof. William H. Timbie, Professor of Electrical Engineering at the Massachusetts Institute of Technology delivered the graduation address.



Adjusting the generator which provides synchronizing pulses to keep RCA television transmitters in perfect "step" with the receivers.



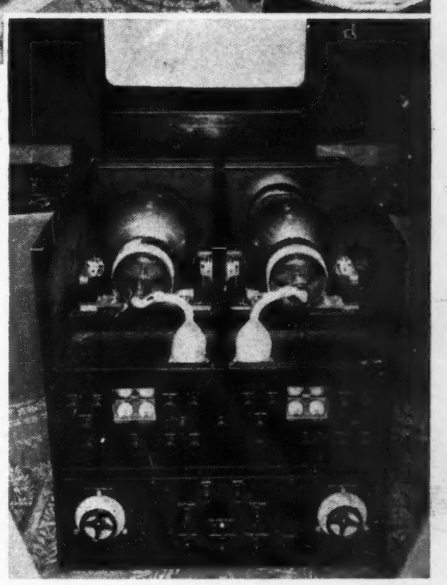
Baird Television installation in the Marble Arch Pavilion in London, where 15′ x 20′ tele-pictures are viewed.

RCA DEALER SERVICE MEN TRAINED FOR TELEVISION

CAMDEN, New Jersey: RCA-Victor plans a special course of instructions to train members of their distributor and dealer service organizations in the New York area to install and adjust television receivers and to instruct the purchaser in their operation. Approximately 125 servicemen have completed the first course according to Edward C. Cahill, RCA Service Manager.

The courses have been conducted by television service experts, from within the famed RCA-Victor service organization at Camden, who have been studying and solving the problems of television receiver installation and servicing dur-

(Please turn the page)



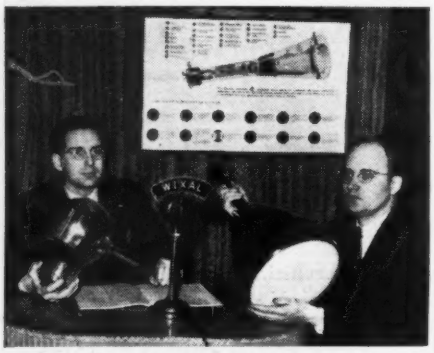
ing the three years RCA-Victor television instruments have been field tested in New York.

"Our distributor and key dealer service men now have a good working knowledge of the receivers and are qualified to set up, install, adjust and demonstrate them after having satisfactorily completed an intensive practical course of study," Mr. Cahill said.

TELEVISION COURSE TO BE CONDUCTED BY W1XAL

BOSTON, Mass.: Short Wave Station W1XAL is conducting a course in "Television" which begins May 15, with rebroadcasts on Fridays. Each lecture lasts a full hour on the air and covers a complete subject, and the entire weekly series enables radio listeners to gain a working knowledge of television.

"While the course is simplified for the layman, it will contain many helpful hints for the servicemen and dealers who may shortly be called upon to install Television sets," said Walter S. Lemmon, Founder and President of the World Wide Broadcasting Foundation of Boston,

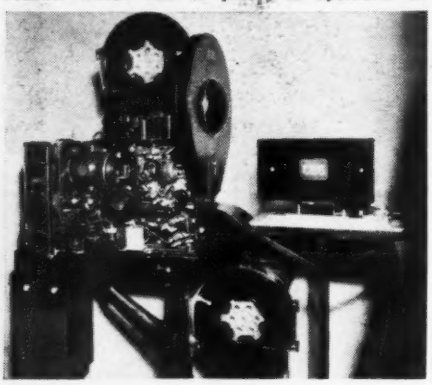


owner of Station W1XAL. The Foundation is a non-profit educational institution and has prepared a complete printed text with diagrams and illustrations to help the listeners follow the instructor at Boston, Dr. C. Davis Belcher, a well-known Radio Engineer, conducts the course.

The Practical Television series is broadcast each Monday evening at 8 p.m., EST, on wavelengths of 6.04 and 11.73 megacycles. The lectures are repeated by electrical transcription at 11:30 p.m., EST, and again each Friday at 4 p.m., EST, over wavelengths of 11.79 and 15.13 megacycles.

CBS ADOPTS REVOLUTIONARY TYPE TELEVISION FILM SCANNER

NEW YORK, N. Y.: Dr. Peter Goldmark, chief television engineer for the Columbia Broadcasting System, has developed a new type of film scanner which will be placed in operation as



soon as the CBS station atop the Chrysler Building is completed.

The principle upon which the revolutionary new scanner works is, of course, a great deal different from that of the standard motion picture projector. In the latter a strip of film is made to pass between a light source and a lens in a continuous series of rapid jerks so that 24 separate photographs or frames can be scanned per second while they are at rest. This is necessary because the eye would see only a shifting melange of light and shade if the celluloid were kept in continuous motion.

It is not desirable to do this in scanning pictures for television, first because for such purposes the film must be scanned at the rate of 60 frames per second to eliminate flicker, and second because stop-motion scanning requires a great deal of light, causes much wear on the film and necessitates a great number of expensive moving optical parts.

Dr. Goldmark and his staff of engineers solved the difficult problem by making the film pass

(*More S & S News on page* 49)

The VIDEO Reporter

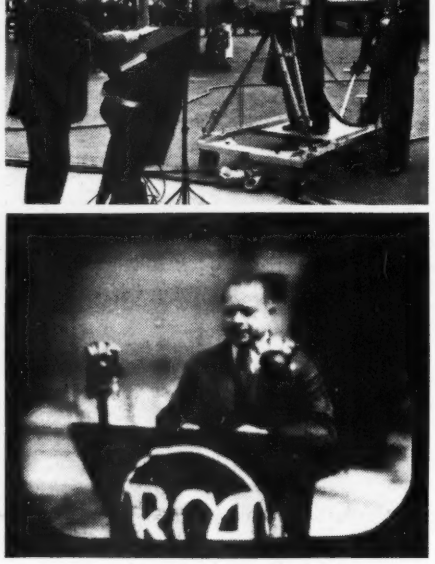
by SAMUEL KAUFMAN

WELL, folks, the lid's off! Television is here at long last!

True, the initial program service is limited to the New York area, but the important thing is that the video ball is rolling at last and, like a snowball, is growing larger and larger as it speeds along. A new industry has been born and it is off to a grand start.

It was anticipated for a considerable time that television would be launched at the time of the opening of the New York World's Fair. But few persons could have guessed that the commercial beginning of the video art would be on as big a scale as it turned out to be.

Most important news of all was to find the bigger manufacturers ready to offer lines. Several smaller set makers did valuable pioneering in kits of parts as well as assembled receivers but the immediate entrance of the "big fellows" gave television a powerful promotional push that impressed the public with the obvious fact that the video art is no mere novelty and is actually a great entertainment medium *that is here to stay.*



Starting the regular television programs, with David Sarnoff, RCA's Pres.

OUTSTANDING feature of the new television lines is the acceptance by manufacturers of the thought that all-wave sound equipment should be included in the same instrument as the video apparatus. This is a natural combination and the decision to do this right at the outset of the commercial start of television was a smart thing.

Another trend that several manufacturers are grasping is the inclusion of an "add-on" unit, a small video attachment that converts any a.c. sound receiver into a television set. *RCA, General Electric* and other makers are merchandising such attachments which make possible the conversion of a radio set into a sight-and-sound receiver at a cost of less than $200.

RCA launched its television receiver line on the day it dedicated its building at the New York World's Fair. A battery of fifteen television consoles was lined up in the *RCA* Building and members of the press witnessed the proceedings at the Fair Grounds in seated comfort. The program, lasting nearly an hour, served the double purpose of introducing the *RCA* line and giving lookand-listeners an idea of what kind of programs they might expect after the commercial launching of the new industry, which has since taken place.

Images of 5, 9 and 12-inch diameter size are available on *RCA* models and, of course, the prices increase along with the picture dimensions.

TELEVISION at the Fair is featured by *RCA* and *General Electric*. The *G. E.* line, incidentally, is similar to the *RCA* offerings, including direct-viewing as well as mirror-lid image screens in an "add-on" attachment and complete console models. Undoubtedly, a lot of other radio manufacturers will be represented with television displays at the Fair—notably *Crosley.*

THE first "official" television broadcast took place from the Fair grounds on the opening day. My impression was that I was more comfortable in the armchair and privacy of a room than I would have been in the midst of the great throngs I saw on the receiver screen.

This brings to mind an old problem that was once raised by radio: Will television hurt the box-office?

My guess is that it won't. Television will develop its own form of entertainment quite apart from the types offered by the stage and screen. It's a human trait to witness things in person. But, if you can't, television is certainly the next best thing.

THINGS are coming along fast at *CBS*, and it is certain that they won't be caught napping on video progress. Gilbert Seldes, television program director, recently made a speedy trip to and from London to observe how the Alexander Palace transmissions were coming along. *Columbia* also announced the appointment of Leonard H. Hole, former director of the program service department, as manager of television operations.

Mr. Seldes had the following to say of British television: "England is far advanced in the matter of television production technique. But each country must develop its own methods, material and style of production. It is only background technique which remains universal. I have already laid out considerable American program material to which this technique will be applied."

TELEVISION kits have been enjoying a brisk sale in the New York area. It seems that the old-timers who are repeating the home assembly and wiring jobs they learned in their youth when radio, too, was young, were quick to take up the idea of putting their own video sets together. And this group was supplemented by a new crop of youngsters who were fascinated by the thought of putting the receiver together with their own hands. The kit-makers have devised ingenious instruction sheets which enable even the least technical of person to

(*More Video Reporter on page* 44)

EASY TO SEE AND WORTH SEEING

by M. W. Thompson
Ft. Wayne, Indiana

In this last lesson of the television series, Mr. Thompson describes how a 3 megacycle sideband transmission becomes a video picture in your home.

W2XCR, New York, held a television demonstration in 1931. Large magnifying glasses in front of whirling scanner disks supplanted the cathode tubes.

IN your reading on television and directions for building receivers, you are going to run into phrases such as "the d.c. component is transmitted"—"the video signal contains the d.c. component"—"the d.c. and low video frequencies are removed"—

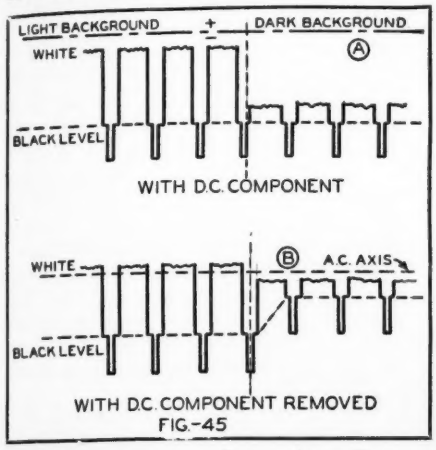


FIG.-45

"this tube acts as a d.c. restorer."

Figure 45A shows six lines of picture and pulses, of which three represent an image with a great deal of white and three are lines of a scene that is rather dark. The d.c. component is present and, it will be noted, the signal and pulses are at all times negative, while the black level always rises to the same amplitude regardless of the average value of black and white.

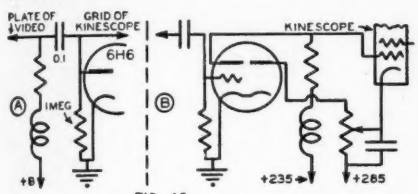


FIG-46

If the d.c. component is removed, the black level no longer has a base to which it can maintain constant amplitude. This condition is illustrated in Figure 45B, and you will at once see that voltages representing the whites and the blacks (including sync pulses) now adjust themselves around a level termed the a-c axis, the *average* amount of white in the picture. Obviously, if this signal reached the grid of the Kinescope, the pedestals and pulses in the "dark background" portion would not be sufficiently negative to swing the grid to black during retrace of the beam.

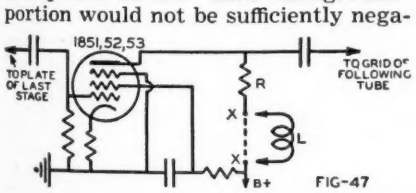


FIG-47

This matter of the d.c. component's presence or absence need not enter into one's calculations when only a single stage of video amplification is used. The d.c. component and the very low video frequencies, are lost only when grid coupling condensers must be employed, and, in a one stage video circuit the grid of the tube is usually connected directly to the cathode of the 2nd detector diode, while the plate of the amplifier connects directly to the grid of the Kinescope.

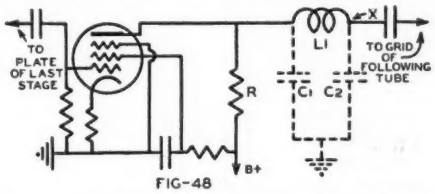


FIG-48

In receivers employing two video stages, from a detector whose output is negative in its shading, or three stages from a positively-shaded detector, it is necessary to use some means of restoring the d.c. component, after it disappears at the coupling condensers, and thus return the tops of the pedestals to a common "black level" and the tops of the pulses to constant amplitude.

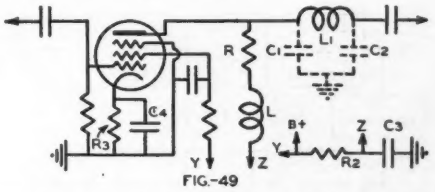
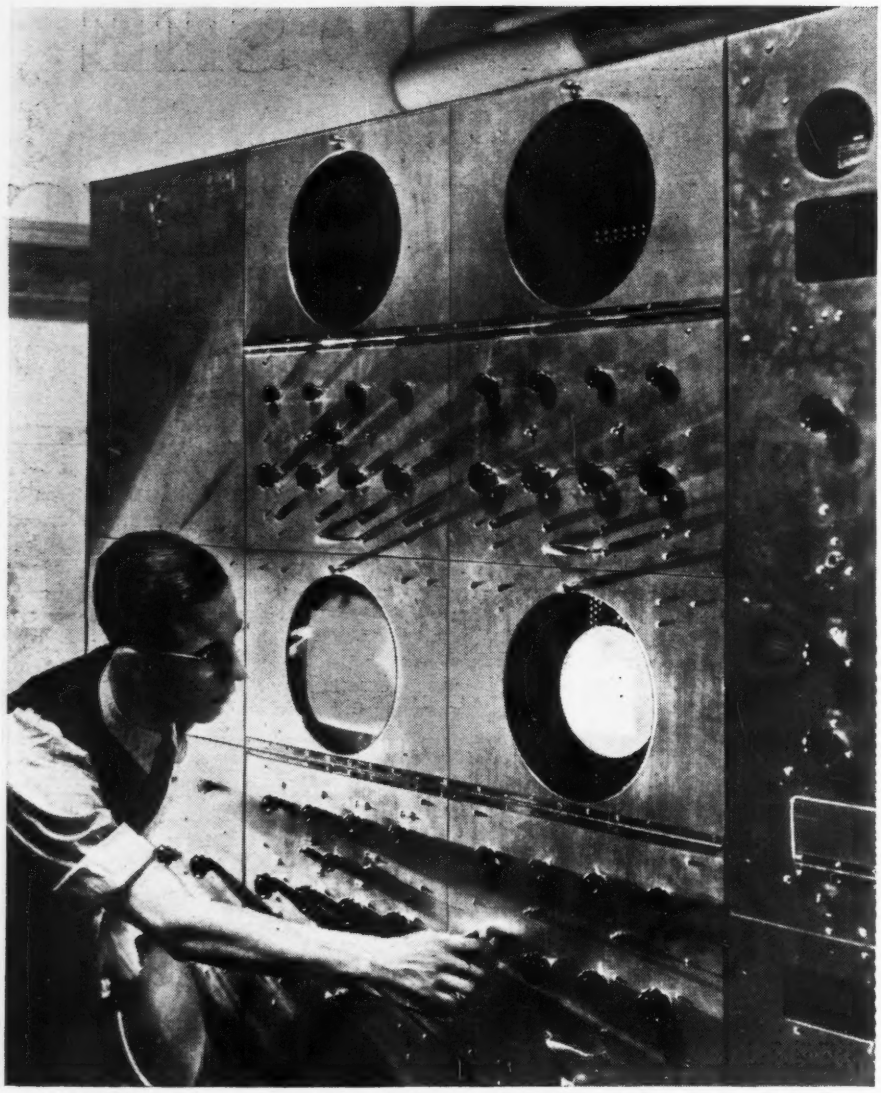


FIG.-49

The two-stage set can utilize a 6H6 diode as shown in Figure 46A. Here, the potential in the lead to the Kinescope builds up a d.c. value in the 1 megohm resistor, to the relative value it originally had in Figure 45A. Not



Cathode-Ray tubes are carefully checked at the factory before being shipped.

only is the d.c. component thus restored, but also the very low video frequencies which found the grid coupling condensers not to their liking.

If one is experimenting with a three-stage video circuit, the third tube can be of the type used in sound receivers for detection, A.V.C. and 1st audio, and containing a pair of diodes and a triode. As shown in Figure 46B, the triode is used with zero grid bias, and the *operating* grid bias will be determined by the d.c. drop across the resistor caused by grid current. Grid current will flow only during the peaks of the sync pulses and this bias will be held practically constant by the charge on the coupling condenser. If a large-value grid resistor is employed, the bias will be kept very small and sync *peaks* will be maintained at zero bias. Signals will now reach the Kinescope grid in their original form (Figure 45A).

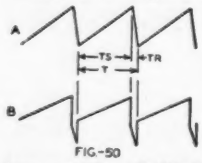


FIG-50

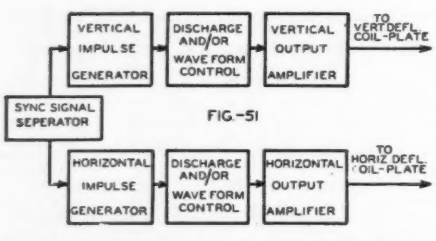


FIG-51

Our study of video amplifiers should, logically, begin with an analysis of requirements and difficulties. It is desirable that a video stage should (1) pass all frequencies with equal gain, and (2) pass them all with equal speed. If the first demand is not complied with, the whites and blacks will not be equally amplified and will not have correct values in relation to each other when they reach the Kinescope. If the second requirement is not met, the whites will be displaced on the screen in relation to the blacks (or vice versa, whichever way one wishes to consider it). It would give a very odd picture if the white picture elements all landed on the screen one-tenth to ¼" right or left of where they should be among the blacks.

The first point just mentioned is called flat frequency response, and the second is termed constant time delay. It is extremely difficult to maintain both response and time delay constant over a band as wide as 60 cycles to 2.8 megacycles (or more). Design usually ends up with a compromise; neither response or delay is exactly constant from lowest to highest frequencies involved, but sufficiently close as to be practically unnoticeable. It is interesting to note that, in the complete sets recently put on the market, the cheaper models with 5-inch picture tubes and but 16 to 18 regular tubes, give 2.1 to 2.5 mc. bandwidth, while larger and more expensive models with 12-inch Kinescope and 25 to 30 radio-type tubes, provide 3.8 to 4.0 mc. bandwidth. It takes a lot of engineering in the r.f., the i.f. and the video stages to accurately put a 4.0 mc. bandwidth on the screen.

Two points to remember: one, that (in multi-stage video amplifiers) the overall *gain* is the *product* of individual stage gains, while *time delay* (spot displacement) is the *sum* of individual stage time delays; two, that the video band may be considered as two separate regions, high and low, and corrective measures are applied to improve either region separately.

Since video amplifiers are, apparently, to be of the resistance-coupled type, let us consider Figure 47 and presume, for the moment, that the inductance "L" is not in the circuit. Such a circuit will amplify video frequencies, but, due to the shunt capacities, unavoidable in wiring, sockets, resistors, etc., there will be a considerable decrease in gain, and some time delay will be introduced, *at the higher frequencies.*

One's first thought is to reduce the value of "R" because reducing it will, to some extent, nullify the effects of the reactance of the shunt capacities. Unfortunately, the gain of the stage as a whole goes down rapidly with reduction of plate load "R." A much better method is the introduction of the inductance "L" which will tend to offset the loss in gain and the introduction of time delay. This inductance, which maintains the load im-

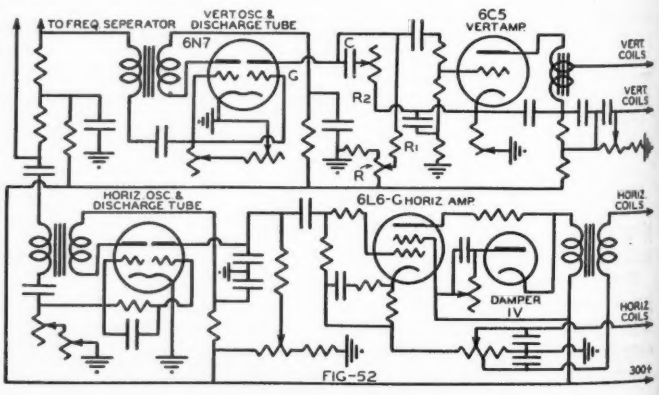


FIG-52

pedance at constant value, regardless of frequency (up to certain limits), is termed a peaking coil—and the corrective is known as *shunt* peaking. Its size can be approximately 85 to 90 turns of No. 34 enamel, single-layer wound on a ½-inch form.

The inductance of a peaking coil is the result of study and measurement of (1) the reactance of the shunt capacities at the highest video frequency we desire to pass, and (2) the load resistor "R." For example, using type 1851 tubes, the strays and wiring will have a load circuit capacity (output of one tube plus input of next) of about 25 mmfd. and we want our bandwidth to extend up to 3 mc. We can secure a gain of 19 with a resistor of 2100 ohms and a coil of 56 mh. but the time delay will vary a little in the upper frequencies. On the other hand, we can secure more uniform time delay with an 1800 ohm resistor and a 33 mh. coil but our stage gain will be reduced to 16. There you are—one of those compromises I mentioned is in order.

The circuit to produce *series* peaking is an interesting one and, if properly designed, will produce 50% greater gain and less departure from constant time delay (see Figure 48). To create it, one should have either a V.T. voltmeter or a "Q" meter, that reasonably exact measurements of C1 (output circuit capacities) and C2 (input circuit capacities) may be made. It is essential that C2 be twice C1, and, fortunately, this condition is usually the case in practice.

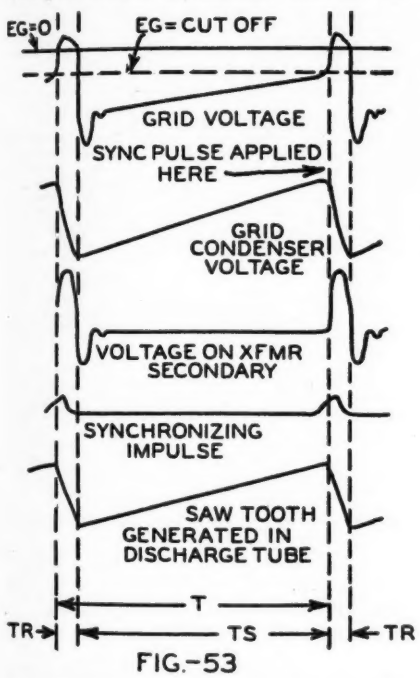


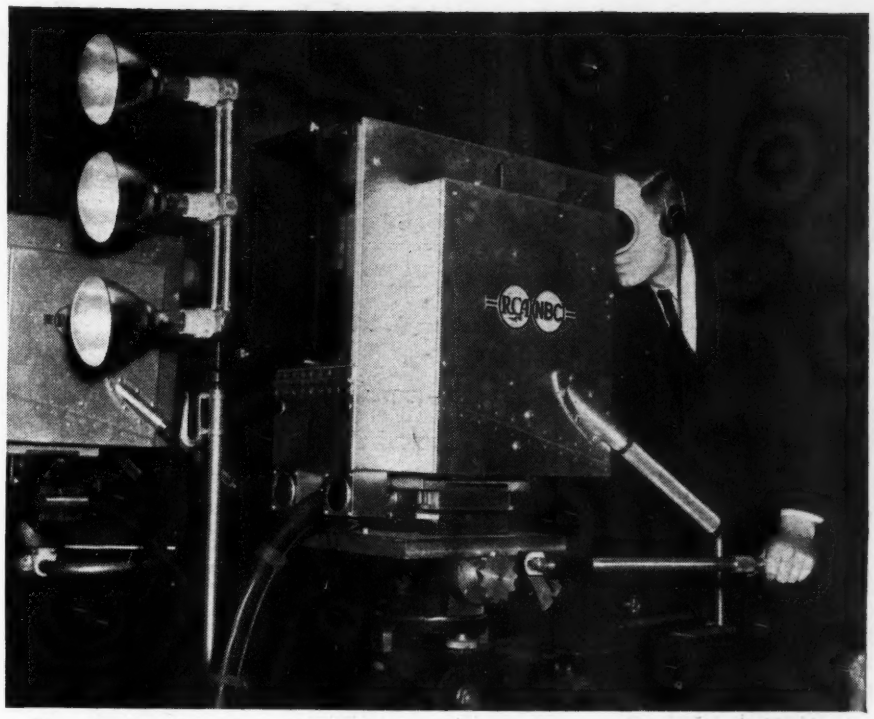
FIG.-53

Having determined C1 and C2 and, if necessary, made adjustments in wiring so that their ratio is approximately 1 to 2, the inductance of the coil "L" may be determined. The formula is L equal 0.67 (C1 + C2) R^2; in which R must be 1½ times the reactance of C1 plus C2 at highest video frequency desired. L is in microhenries, C1 and C2 are in microfarads and the "Q" of inductance L must be at least 20. Should the ratio of C1 to C2 be less than 1 to 2, there will be peaking at the higher frequencies; should circumstances make it unavoidable that C1 be double rather than ½ of C2, merely switch the resistor R to point X.

For greatest gain, a combination of shunt and series peaking should be used, providing you have the equipment to measure C1 and C2 (see Figure 49). With these known, R should equal 1.8 times the reactance of C1 and C2 at top frequency, L is determined by 0.12 (C1 + C2)R^2 and L1 is calculated by 0.52 (C1 + C2) R^2. Such a circuit will give, roughly, 80% more gain than shunt peaking and 20% more than series peaking.

Imperfections in a video stage that cause a lessening of gain, and introduction of time delay at higher frequencies, will impair the reproduction of *horizontal detail;* it is necessary that consideration be given, also, to factors that affect the very low frequencies from 100 to 200 cycles and which supply the *background* of the picture. Imperfect handling of these low frequencies may result either from the inability of the grid condenser and resistor to properly pass them, or from insufficient bypass condenser on the cathode bias resistor.

To correct the former, the capacity-resistance filter shown with the circuit of Figure 49 is employed. The low potential end of coil L, labelled "Z," connects to "Z" on the c-r combination, and the point "Y" of the screen resistor goes to "Y" in the smaller circuit. To correct cathode bypass trouble, the formula C4 × R3 equals C3 × R2 is used, and in which R2 equals R3 (gm R), while C3 equals C4/gm R.


Even during this series, telecasts have made progress,—specially with telecameras.

Some of the values for good performance of the circuit of Figure 49, using an 1851 tube, would be R is 2000 ohms, R2 is 2500 ohms, R3 is 150 ohms, C4 is a 25 mfd. electrolytic, and C3 is 1.5 mfd. This hook-up has other advantages aside from improvement in low frequency response; there is a definite filtering action against B-supply hum, and considerable suppression of tendency to motorbeat.

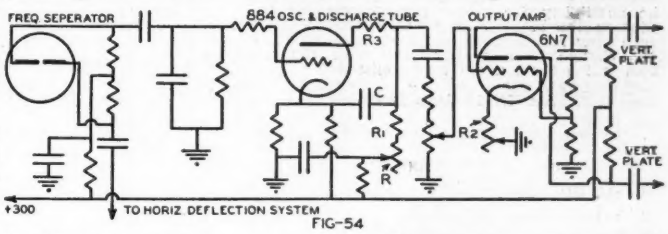
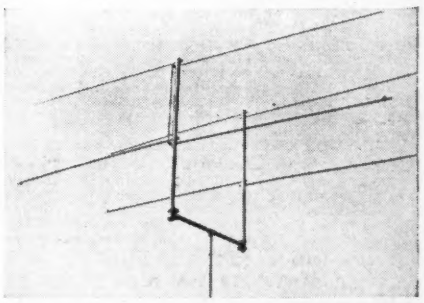


FIG-54

In planning a television receiver, one finally reaches the point where a decision must be made as to the system of deflection preferred and the type of picture tube to be used. All picture tubes (Kinescope, Videotron, Teletron, etc.) have three points in

(*Study further on page* 51)


RCA's new reflector-antenna system that does wonders with tele-ception.

Serviceman's

by ALFRED A. GHIRARDI, B.S., E.E.
Author of "The Radio Physics Course," "Modern Radio Servicing"; member Radio Servicemen of America, New York Electrical Society, Institute of Radio Engineers.

● ● ● ●

ARVIN 10A

Hum (after replacing '84 tube) — 1) install a metal shield over the tube and ground

Howl (when set is cold) — 1) reverse the primary leads to the reflexed audio transformer

Howl — 1) check the 12-mfd., 25-volt electrolytic condenser. Replace if faulty

Production changes (incorporated in more recent productions of the model—for improved performance) — 1) a 200-ohm, ¼-watt resistor **(R14)** has been added in the power pack across the vibrator points
2) the 100,000-ohm, ¼-watt resistor **(R3)** in the 6A7 No. 1 grid circuit has been changed to 50,000 ohm, ¼-watt **(R29)**
3) a bayonet-base pilot light is used instead of the one with the screw base
4) a 4-prong speaker-plug socket is used instead of the 3-prong socket
5) an ammeter cable and fuse has been added
6) it was found necessary to change the mechanical design somewhat to eliminate the possibility for motor noise pickup at the point in the receiver case where the local-distance plug and tone-control plug were attached. This change is made beginning with the sets from which the louvers were omitted

ARVIN 16 Auto Radio

How to increase sensitivity in districts where signal strength is abnormally low — 1) remove inter-channel noise-suppression feature by disconnecting resistor **R-7** (the resistor in series with the second-detector cathode) at point **A** and reconnecting it directly to the cathode of the second detector tube. Thus the diode plates will no longer be biased, and the sensitivity will be slightly increased

ARVIN 17 Auto Radio

See also Case Histories listed for Arvin 7

Oscillation (while tuning) — 1) poor "ground" contact through metal collar to chassis on condensers **No. 17-4731** and **No. 17-4712.** Replace with new type **No. 17-14020** and **No. 17-14007** condensers equipped with separate ground leads

Ignition noise — 1) check to see that all cables are properly "grounded"

Hum — 1) replace original triple 4-mfd. electrolytic filter condenser with a triple 8-mfd. section. This can be obtained in a single can to fit in the original mounting. Connect two 8-mfd. sections to cathode of the 84 tube. Connect the remaining section to the connection from which the original 4-mfd. unit was removed

Circuit improvement — 1) the performance of early-run models of this receiver may be improved by changing the 100,00-ohm ¼-watt resistor **(R3)** in the 6A7 No. 1 grid circuit to a 50,000-ohm ¼-watt unit

ARVIN 18 Auto Radio

Distorted, mushy tone. Weak reception when jarred — 1) faulty 0.05-mfd., 160-volt condenser (mounted through chassis near the power pack) connected from the volume control to the resistor on the end of the second i-f transformer

ARVIN 19 Auto Radio

Motor interference which persists even if antenna is disconnected from receiver — 1) this interference is caused by chassis pickup. Remove the radio chassis front cover and sandpaper the rim of the cover to remove all grease and paint
2) ground the shield of the '78 or 6A7G tube, and ground the shielding partitions in the tuning condenser. Use narrow copper braiding to ground these to the chassis

Raspy noise when dialing — 1) remove ground finger springs at each end of gang condenser rotor. Replace with new type of heavier construction

ARVIN 20A Auto Radio

Inoperative — 1) inspect r-f chassis unit and if the tube heaters are not lit, repair the broken "A" choke in the audio unit
2) if the tubes in the r-f chassis light up but the vibrator is not heard, check this same choke for a break at the opposite end

Receiver overloads on powerful local signals — 1) replace the '75 tube with an '85 tube. This will reduce the sensitivity somewhat, but will improve the tone

ARVIN 25 Auto Radio

Inoperative — 1) short-circuited tone control **(Note:** this is a tapped condenser-type unit)

Intermittent reception — 1) replace dual 0.015-mfd. antenna coupling condenser

No reception. Vibrator sounds weak — 1) "shorted" dual 0.02-mfd. condenser used as a buffer across power transf. sec.

Noisy (after operating for an hour or so) — 1) partially shorted 0.05-mfd. coupling condenser

ARVIN 27 Auto Radio

See also Case Histories listed for Arvin 7 and 17 receivers

Low volume (with a type '6B7 second detector and amplifier tube) — 1) change the value of the 200,000-ohm type '6B7 tube plate resistor to 300,000 ohms

Intermittent reception. Intermittent oscillation — 1) intermittent or high-resistance connection between the bodies of the metal-can condensers and their mounting flanges. Bond the condenser bodies to their flanges with solder

Production changes (incorporated in more recent productions of this model—for improved performance) — 1) the 100,000-ohm, ¼-watt resistor **(R3)** in the 6A7 No. 1 grid circuit has been changed to 50,000 ohm, ¼ watt **(R29)**
2) a 1000-ohm, ¼-watt resistor **(R24)** has been inserted in the 6A7 No. 1 grid circuit
3) the 400-ohm, ¼-watt resistor **(R2)** has been changed to 500 ohms, ¼ watt **(R10).** Allowable variation in **R2** is from 200 to 600 ohms. Allowable variation in **R10** is from 400 to 600 ohms
4) the 500-ohm, ¼-watt resistor **(R10)** in the cathode of the 78 tube has been changed to 1500 ohms, ¼ watt **(R28)**
5) the condensers **C12** and **C26** have been combined into one dual unit with capacities of 0.006-mfd., 800-volt and 0.25-mfd., 400-volt, respectively. The lead with the red dot is the 0.006 unit
6) a suppression choke **(X5)** has been added in the "A" lead. A 0.002-mfd. mica condenser **(C6)** is used ahead of the choke
7) a bayonet-base pilot light is used instead of the one with a screw base
8) a 4-prong speaker-plug socket is used instead of the 3-prong socket
9) an ammeter cable and fuse has been added
10) it was found necessary to change the mechanical design somewhat to eliminate the possibility for motor noise pickup at the point in the receiver case where the local-distance plug and tone-control plug were attached. This change is made beginning with the sets from which the louvres were omitted
11) beginning with serial No. **D44011H** the type 75 tube was replaced with a 6B7; triode-connected
12) the 0.003-mfd., 600-volt condenser **(C25)** was changed to 0.006 mfd., 600-volt **(C26)**
13) beginning with serial No. **E45219H,** the triode connection on the 6B7 was changed to a pentode connection. The changes indicated below were therefore required
14) a 0.25-mfd., 400-volt condenser **(C12)** was added as a screen by-pass from the screen of the 6B7 tube to ground. A 1-megohm, ¼-watt resistor **(R9)** was added as a screen-dropping resistor from B-plus to the screen of the 6B7 tube. The 0.006-mfd., 600-volt condenser **(26)** was changed to 0.003 mfd., 600 volt **(C25)**
15) under the conditions outlined above, voltages on the 6B7 are approximately: plate, 60; screen, 30 and cathode, 1.7 volts. A 1000-ohms-per-volt voltmeter was used for these measurements

ARVIN 29 Auto Radio

See also Case Histories listed for Arvin 19 Auto Radio

Oscillation (when volume is turned on full and tone-control is at the low-pitch setting) — 1) move the r-f by-pass condenser which is in the plate circuit of the 6A7 tube to a new location behind the shield. The red lead goes to the B+ line. (Receivers bearing serial number above **A28200B** have already had the 0.1-mfd. condenser changed to the new location
2) some 6Q7G tubes have very high gain and are responsible for this oscillating condition. Often, changing this tube remedies the oscillating condition
3) another possible remedy (if the plate by-pass condenser mentioned in section 1 is not changed) is to replace the 6V6G output tube with one having a mutual conductance of 3200 to 3800 microhms. Often a 6V6G tube has a particularly high gain which contributes to an oscillating condition in a certain receiver

ARVIN 30A Auto Radio

Same Case Histories as those listed for Arvin 20A Auto Radio

ARVIN 35 Auto Radio

Poor tone — 1) replace both 0.01-mfd. audio-coupling condensers with mica-moulded condensers of the same value

ARVIN 37 Auto Radio

Same Case Histories as those listed for Arvin 7 Auto Radio

Circuit improvement — 1) the performance of early-run models of this receiver may be improved by changing the 100,000-ohm ¼-watt resistor **(R3)** in the 6A7 No. 1 grid circuit to a 50,000-ohm ¼-watt unit

ARVIN 39 Auto Radio

Same Case Histories as those listed for Arvin 19 Auto Radio

ARVIN 41, 51 Auto Radios

Distortion at low volume-control settings, and on strong signals — 1) overbias on type '6F7 tube grid. Remove the 100-ohm resistor from the cathode circuit of this tube, and connect the cathode to ground through an 800-ohm resistor. The volume control will then affect the bias on the 6A7 tube only, rather than

Case Histories

Continuing the series by Mr. Ghirardi. Servicemen would do well to save these sheets, since together they will make up a good trouble-shooter's guide.

on both this tube and the '6F7. Fix-bias the latter independently

ARVIN 62 Auto Radio

Noisy (when tuning dial is rotated) .....1) solder the bottom arm on the planetary drive system to the bracket at the bottom front end of the condenser gang

ARVIN 65 Auto Radio

Ignition interference .1) clean surface joints on front cover of receiver to remove all paint and grease
2) check the "acoustinator" plug to see that good grounding contact is obtained
3) check the right-hand breather screen for ground. "Spot" it with solder to the housing

ARVIN 81M Auto Radio

Hum .....1) remove push-pull audio input choke from top of chassis and mount it underneath. Try rotating to different angles while the receiver is operating, to find the minimum hum position. Then mount it in that position

ARVIN 617 Auto Radio

Crackling, Flickering pilot lights ....1) dial frame is not properly grounded to receiver chassis. Run a short, flexible lead between the two, and solder it securely in place

ARVIN 927

Faulty performance of 6G5 Magic Eye ..1) first check the 1 megohm resistor (contained within the 6G5 socket assembly) for an "open" condition
2) if foregoing test does not reveal trouble, check the AVC network

ARIN 1237

Inoperative ...1) check for "short" in moulded bakelite by-pass condenser in first i-f transformer
2) also replace the 1,000-ohm plate-dropping resistor in this circuit

"Bass" too pronounced at low setting of volume control ...1) remove the bass-compensating connection on the volume control. This consists of an 18,000-ohm resistor in series with a 0.03-mfd. condenser

ARVIN 1427

See also Case Histories listed for Arvin 1237 receiver

Station shift on push-buttons ...1) replace original fibre oscillator-trimmer strip with new isolantite type. Seal the trimmers after adjusting

ATWATER KENT (General Servicing Data)

Flat ribbon tuning drives ...1) these flat ribbon belt drives can be replaced with phosphor bronze dial cable. Solder the cable to the pin on the pulley that originally went through the belt

Noisy volume control ...1) many noisy volume controls can be repaired by simply removing them from the chassis, swabbing the winding with a cloth saturated with alcohol or Carbona, and bending the slider arm so it makes firmer contact with the resistance winding. Also tighten it against the tension spring

ATWATER KENT ALL-WAVE BATTERY RECEIVERS

Poor quality, High battery drain, Oscillation ..1) leaky 8-mfd., 200-volt electrolytic condenser connected to B-plus. Replace with new unit of higher voltage rating.

ATWATER KENT Early D.C. Receivers

Audio howl ...1) most frequently caused by microphonic '12A detector and 1st a-f tube. Try new type tubes; also a heavier howl-arrester cap than the one furnished, if necessary

ATWATER KENT H-1, H-2

Inoperative ...1) open-circuited antenna choke
2) short-circuited i-f trimmer condensers. Replace mica dielectrics and re-align the i-f amplifier

ATWATER KENT "L" CHASSIS

Oscillation, Set "dead" ...1) dirty or corroded connections at rotor spring contacts on the condenser gang. Clean and increase tension of springs or solder flexible pigtails between the rotor and the condenser frame

Oscillation (sensitivity switch in "local" position ....1) coupling between wire leading to switch and r-f choke. Bend this wire away from the coil opening
2) the coil opening coupling between the red wire from the switch and the r-f coils. Move the wire away from vicinity of coil openings

Lack of voltage on the detector or first audio tube 1) burnt-out filter resistors
2) short-circuited condensors
3) burnt-out plate circuit resistors
4) burnt-out input transformer

ATWATER KENT L1

Distortion, Hum ....1) bias resistor for the '45 output tubes "open"

ATWATER KENT Q

Audio howl ...1) shunt the secondary of the first a-f transformer with a 100,000-ohm resistor. Shunt the secondary of the push-pull input transformer with a 150,000-ohm resistor

ATWATER KENT 2

Receiver goes dead suddenly while operating ..1) replace the double-pole double-throw toggle switch for a new one

ATWATER KENT 7-D

Squeals at low volume ..1) leaky condenser C18. Replace with an 8-mfd., 400-volt unit
2) open-circuited section in i-f transformer T5. Replace with new unit

ATWATER KENT 30

Poor sensitivity
Poor selectivity ..1) replace antenna coil with a compensator coil; i.e., a center-tapped coil, connecting one end to grid, the other to ground, and the tap to the antenna terminal. If oscillation occurs now, increase resistance of grid resistors

Set "dead" ....1) test the speaker filter condenser. Replace with a 0.5-mfd. paper-dielectric unit
2) wire-wound plate resistor under chassis "shorted" to ground. Trouble caused by warping of fibre base. Slide a piece of fibre or insulating paper under the unit

Weak, or no reception ...1) fibre base of resistor under chassis warped, causing resistor element to "short" to ground. Slide a piece of fibre or stiff cardboard under unit to straighten it

ATWATER KENT 35

Lack of volume .....1) drill out one eyelet from the support bracket of the second r-f transformer. Turn the coil just far enough out of line to keep the set just under the oscillating point at the high-frequency end of the dial
2) same Case History as listed for "Poor sensitivity," "Poor selectivity" under Atwater Kent 30 receiver

ATWATER KENT 36

Hum .....1) often caused by loosened nuts on the grounded posts of the power pack terminal strip. This opens the filter condenser circuits. Tighten these nuts

ATWATER KENT 37, 38

Inoperative ...1) short-circuited filter condenser
2) short-circuited speaker output condenser. Test quickly by checking plate voltage at '71A tube socket. If it is low disconnect one speaker lead and plug analyzer test plug into '71A tube socket. If plate voltage is now at normal value, replace the speaker output condenser
3) short-circuited r-f by-pass condenser (for Model 37 only)

Weak reception ...1) open-circuited first a-f plate resistor
2) open-circuited detector plate resistor
3) tuning belts loose
4) tuning condensers not synchronized
5) Connect a 1-mfd., 400-v. condenser between filament of 280 tube (where it connects to the first filter choke) and ground. Necessary to open the cans to do this. Also reduces hum

Weak and distorted signals ....1) if output tube plate voltage is low (or zero), check speaker filter condenser for full or partial "short" by disconnecting the speaker. If this makes the plate voltage and current of the output stage increase to normal, replace this speaker filter condenser with a 0.5 or 1.0-mfd. 400-volt paper-dielectric unit
2) if there is no detector plate voltage, check the resistor located under the cable template in the power pack—the one which connects the two lugs on the end of the template where the cable joins it
3) dirty volume control. Clean with alcohol

To improve sensitivity ...1) same Case History as listed for "Poor sensitivity," "Poor selectivity" under Atwater Kent 30 receiver
2) connect a 1-mfd. 400-volt condenser between filament of '80 tube (where it connects to the first filter choke) and ground. This will increase the filter output voltage, reduce hum, and give the receiver more pep. (It is necessary to open the cans to make this alteration)

To increase selectivity ...1) mount a 3-gang trimmer on top of the tuning gang and re-balance with these trimmers connected across the individual tuning condenser sections. Make sure that the rotor section of the tuning condenser is well grounded
2) decreasing the resistance value of the suppressors for the 2'nd and 3'rd r-f tubes, from 800 ohms down to 500 or even 400 ohms helps. This introduces a slight amount of regeneration and increases both the selectivity and the sensitivity

Intermittent reception ...1) loose nuts on power pack terminal strip
2) antenna lead short-circuiting to shielding braid
3) Press down rear of chassis. If this causes noise, insulate shielded antenna cable leading from rear of cabinet to front of chassis, so it cannot touch the bare ends of the power cable (for Model 37)

ATWATER KENT 37, 38 (Cont'd)

Noisy reception ...1) loose nuts on power pack terminal strip
2) defective volume control resistance strip
3) dirty volume control resistance strip and contacts (for Model 37 only). When installing new volume control strip, first connect it (in series with a 75-watt lamp) across the 110-volt line for about 1 minute. The heat produced will make the strip pliable so it can be inserted in the shell easily and without breakage

Hum .....1) often caused by loosened nuts on the grounded posts of the power pack terminal strip. This opens the filter condenser circuits. Tighten these nuts.

(To be continued next month)

SHORT WAVE FLASHES

BY CHARLES A. MORRISON

and JOHN D. CLARK

By Charles A. Morrison

Frequency in megacycles *Time is Eastern Standard*

Special Good-Will Programs

FRIDAY, June 30, from 7 to 8 p.m. EST, over OAX4J (9.34) of Lima, Peru.

Sunday, August 20, from 1 to 3:30 a.m. EST, over TGWA (9.685), TGWB (6.49) and TGWC (2.32), all of Guatemala City, Guatemala.

Special Exposition Travelogues

Features of the New York World's Fair and the Golden Gate International Exposition on Treasure Island in San Francisco, is being described during the travelogue series over stations W2XAD (15.33) and W2XAF (9.53), on Mondays at 4:30 p.m. EST, Subjects for the next few programs will include: On June 5, Hall of the Western States on Treasure Island; June 12, Wonderlands of Southwestern U. S. A.; June 19, Fine Arts at the Fairs; June 26, Brazil at the Fairs; July 3, Washington, D. C., and the Potomac; July 10, The Lordly Hudson; July 17, The Orient and the Fairs; July 24, Argentine at the Fairs; July 31, Rockefeller Center—New York City; August 7, Chicago and the Great Lakes; August 14, World Travel to Both Fairs; August 21, South Pacific and the Golden Gate Exposition and August 28, "Fun at the Fairs."

New York World's Fair Radio Club

When visiting the New York World's Fair, don't miss the World's Fair Radio Club headquarters, where 14 amateur transmitters are in constant operation and messages are being accepted for free delivery to any part of the world. The club is headquarters for visiting amateurs and dx'ers. Kay I. Kibling, W2HXQ in charge of the Entertainment Committee for the Club, will gladly arrange to have you shown around the exhibit. On Friday nights, the Club sponsors amateur broadcasts direct from the Fair. The transmission at 9:45 p.m., originates on 5 meters; the one at 10:15 p.m. EST, on 10 meters. Both are rebroadcast by several amateur transmitters on each amateur band, including W2EOA (14.2) and W2HXQ (3.95). Listeners hearing these QST's are invited to send reports both to the station heard rebroadcasting the transmission and to the N. Y. World's Fair Radio Club, Flushing, New York. QSL cards will be forwarded from both sources, and the World's Fair Official QSL Card is particularly attractive.

The "Flying Hutchinsons"

"The Flying Hutchinsons," world's most air-minded family, "good will ambassadors" of *Columbia Broadcasting System's American School of the Air*, are now winging their way around the world with flight over 68 nations as their goal, 50-watt transmitter KHAGH aboard the Hutchinson's plane, may operate on any one of the following frequencies: 3.082, 3.105, 4.122, 4.967, 5.692, 6.2, 6.21, 6.18, and 8.28 mcs. *CBS* will pick up the Hutchinsons by short wave from Tokyo, sometime between June 26 and July 20.

New Short Wave Stations (On the Air)

CHINA—XGOY (11.9), relays XGOA of Chungking, daily from 7 to 11:30 a.m. and from 4 to 6:30 p.m., the latter transmission being particularly well received in Europe. News in English is radiated at 9 a.m. and 6 p.m.; news in German at 4:50 and news in French at 5:15 p.m. A lady announcer makes frequent announcements in English. XGOX (17.8), Chungking, transmits a program for North America, nightly from approximately 9 to 11 p.m. A station on 7.173, has been heard relaying XGOA irregularly from 6:30 to about 9 a.m. This is believed to be another frequency for the Chungking station.

CUBA—COX (6.39) of the Cultural Department of the Cuban Army has been testing almost daily from 4 to 6 p.m. Reports are solicited and should be sent to Cuerpo de Senales, Ciudad Militar, Habana, Cuba.

FRENCH INDO-CHINA—"Radio Saigon" (6.116), P.O. Box 412, Saigon, is being heard on the West Coast, with loud signals daily from 6 or 7 to 9:30 a.m. English transmissions are radiated weekdays from 8:45 to 9 and on Sundays from 8 to 9 a.m. All correct reports sent to "Radio Saigon" will be verified.

GUATEMALA—TGWC (2.32), the new relay for TGW of Guatemala City, Guatemala, broadcasts simultaneously with TGWB (6.49), weekdays from 8 to 9 a.m., 12:45 to 3:45 and 7:30 p.m. to 12:15 a.m. and on Sundays from 10:30 a.m. to midnight. Power of the station is 1000 watts.

HUNGARY—HAAQ2, Budapest, 200 watts, is transmitting special experimental broadcasts irregularly as follows: Directional to North America, on 21.68, from 8 to 11 a.m.; on 9.625, from 5 to 8 p.m. and on 7.22, from 8 to 11 p.m.; Directional to South America, on 21.68, from 9:30 a.m. to 12:30 p.m.; on 11.85, from 12:30 to 3:30; on 9.625, from 3:30 to 6 and on 7.22, from 8 to 11 p.m. Call letters are repeated in Spanish, English and Hungarian frequently. During these transmissions HA1K is in operation on the 7, 14 or 28 mcs. bands, attempting to contact amateurs in various countries for immediate reports on reception of HAAQ2. All reports should be sent to Radio Labor, Budapest, IX-Gyali-ut 22, Hungary.

JAPAN—JLU3 (15.135), is now in operation daily from 8 to 9:30 a.m. with the overseas hour program for the South Seas; JVW3 (11.73), may be heard broadcasting irregularly from midnight or 1 to 2 a.m.; JVW (7.255), JVW2 (9.67) and JVW4 (17.82), are being heard irregularly in New Zealand; Unidentified transmitters on 15.24 and 8.5 are being heard irregularly from midnight to 1 a.m. and from 6:30 to 7:30 a.m. respectively.

JAVA—Ashley Walcott of San Francisco, Calif., writes the following new stations are now in operation, relaying the NIROM native network: YDA8 (1.680), Magelang, 20 watts, and YDF (4.96), Soerabaja, 150 watts.

MEXICO—The Newark News Radio Club, reports XEBN (6.09), a new relay for XEFO of Mexico D.F. is being heard to sign-off at 11 p.m.

Ray Shaffar of Waterloo, Iowa, writes he heard an unidentified station in Veracruz, testing on 6.12, at 3:45 a.m. . . . XEOQ (6.08), "Radio Panamericana," relaying XEQ of Mexico D.F., is being heard from as early as 6 to 11:30 p.m. or later.

TAIWAN—An unknown station, presumably in Taiwan, operating on a frequency of 7.325, is relaying broadcast station JFAK daily from 9 to 10:30 a.m. JFO (9.636) and JIB (10.535), the usual relays for JFAK, now sign off at 8:55 a.m.

UNITED STATES—The Cruft Laboratory of Harvard University, has been licensed to operate a 1000 watt portable general experimental station irregularly on any of the following frequencies: 1.614, 2.398, 3.492, 4.797, 6.425, 8.655, 12.862 or 17.31.

Under Construction

AUSTRALIA—The Australian Broadcasting Commission is installing VLW, a new 2000 watt short-wave transmitter at Wanneroo, West Australia. Licensed to operate on 11.83, 9.56 or 6.13, it will provide much improved radio reception throughout northwest Australia.

UNITED STATES—The General Electric Company of Schenectady, N. Y., has received permission to operate its new 100,000 watt transmitter on 6.19, 9.53 or 21.59 mcs. This would seem to indicate the powerful new unit will be in use soon.

VENEZUELA—The Venezuelan Government has placed an order for a 20,000 watt short-wave transmitter, which will probably be installed at Caracas. The new station will be used for both commercial and broadcast purposes it is believed.

Notes

ALASKA—Ashley Walcott of San Francisco, Calif., reports hearing K7GTP (3.9), Unalaska, calling and working KIKV and K7FKV, Bethel, on emergency aircraft traffic at 5:23 a.m.

ALGERIA—TPZ (8.95), Algiers, broadcasts to Asia, on the first and 3rd Tuesdays of each month, at 4 p.m.

ARGENTINA—LRA1 (9.695), signs-off at 9 p.m. with a clock striking the hour. LSX (10.35), now broadcasts regularly on Fridays from 4 to 5:45 p.m.

AUSTRALIA—The power of Melbourne stations VLR/VLR3 has been increased to 2000 watts.

AZORES—Roger Legge of Binghamton, New York, reports CT2AJ (4), Ponta Delgada, is well heard Saturdays to 7 p.m.

BECHUANALAND—ZNB (5.9), Mafeking, contacts ZNF, Ghanzi, and ZNC, Maun Fridays at 11 p.m., collecting aircraft weather data which it passes on to ZUN at Windhook, Southwest Africa. In a rare reception feat the above schedule was picked up in January and has now been definitely verified by H. Amers of Pomona, Calif.

CANADA—Broadcast station CJRC has been testing with mobile portable VE9DZ (27.1), mornings near 4 a.m. Reports should be sent to the Engineering Department of CJRC, Winnipeg. CHNX (6.132), Halifax, gives stock reports at 6:55 p.m.

CHINA—XTC (9.295), Shanghai, is back on the air again and broadcasting in Chinese from 8 to 9 a.m.

CORSICA—A. Tuff of London, England, states the mystery station, "Radio Corse Libre," is being heard, on frequencies ranging from 9.6 to 9.685, daily from 11 a.m. to noon. W. Stark of Wauwatosa, Wisconsin, reports "Radio Nationalist" (9.685), heard from 5:30 to 7 p.m. This is undoubtedly the same station.

CUBA—The new Havana station COCE (12.23), is being heard nightly to 11:30 p.m. The signature selection is an organ melody. COKG (8.96), Santiago, is anxious for reports. A Cuban cigar, booklet showing how to mix cocktails and a QSL card is promised to those sending in reports.

DOMINICAN REPUBLIC—HIN (6.243), Trujillo City, is now operating daily from 5 to 11 p.m.; the interval signal consists of a three-note chimes. HIT (6.63), identifies itself as HIT, "Hit of the Air." HI1Z, formerly HIZ (6.315), Trujillo City, signs-off with a march at 10:20 p.m.

ECUADOR—John Oskay of New Brunswick, New Jersey, is hearing HC2AB, location unknown, on 9.185, near 9 p.m.

FRENCH INDO-CHINA—"Radio Boy Landry," Saigon, is being heard on the Pacific Coast on a frequency of 9.7, irregularly from 7:30 to 9:45 a.m.

GERMANY **— According to the Australian DX Club, authorities of the Berlin Short Wave Station have requested short-wave listeners to please refrain from mentioning political affairs in their reports to them. Why?**

The Anti-Nazi station previously reported as being caught and demolished, was on the air within 45 minutes after the report, and is still on nightly!

HONDURAS—Spanish and English announcements are made each half-hour on programs broadcast by HRN (5.875) of Tegucigalpa.

KENYA—Richard Rubio of Havana, Cuba, writes VQ4MSR (6.35) of Nairobi, has been testing with England, afternoons from 2 to 2:30 p.m.

(More DX Notes on page 62)

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Radio News, Dept. 79D
608 S. Dearborn St., Chicago, Ill.

Enclosed find 75c. Send me the next six issues of RADIO NEWS and rush a copy of the 1939 RADIO DATA BOOK to me without charge. (If renewal, check here ☐.)

Name .....

Address .....

City ..... State .....

If you are a serviceman please check here ☐.

Within Earshot
(*Continued from page* 4)

from the manufacturer even if he is not running any sort of legitimate radio business at all. All was OK until the jobbers found out that they were being squeezed. Such a situation is hardly fair to the real jobber who has an enormous overhead and employs many people. His territory should be protected and he should not be made to go into competition with the pseudo-"jobber" who wants a discount mostly so that he, personally, can buy cheaper. If this is not corrected—and it should be by the manufacturers themselves—the profits of the whole system will be lowered, as will the standards of the trade. It must inevitably result in lower wages for the employees and lower returns for the manufacturer, forcing him to abandon any contemplated improvements or expansions. In other words, the condition is one which is unhealthy, and the sooner it can be eliminated the better it will be for all concerned.

* * *

WE are often asked, "Why can't we make a go of our ham club? Can you give us some advice?" Well, ham clubs depend on the mutual interest of the members to keep them going. With ham radio having as its keystone the rugged individuality of the members, it is hard for them to have any common meeting ground other than "radio." Unfortunately, this subject is not one which can be debated over and over again each and every night "on the air" and leave anything over for the club meeting. Hence interest lags, and finally the club "folds."

The only suggestion that we can offer for making a success of a ham club is to arrange for interesting and not-so-often heard speakers for the meetings. That will keep the men together. Next we urge that every club take an *active* part in national ham affairs by joining the A.R.R.L. and fighting for the betterment of hamdom. Affiliation with the Army Amateur Radio System or the Naval Radio Reserve are also two good moves. Association with the local R.I., police, aviation, and broadcasters are all public-minded activities that will serve to mold your club firmly. Finally there are outings, dances, hamfests, picnics and the whole gamut of social "shindigs" that are infallible aides to club life. Try any one or all, and see if they can't help. Anyway, don't be discouraged.

AND that about winds up our stint for the month. We are anxious to hear from readers on the contents of R.N. Do you like the streamlined presentation? Your suggestions are earnestly solicited in an effort to give you the best doggone radio magazine possible. If you want to see some type of article in print, let us know. We aim to please.—K.A.K.

—30—

What's New in Radio
(*Continued from page* 20)

The Hammarlund Manufacturing Co., Inc., 424-438 West 33rd Street, New York City, announce a new 100 watt transmitter with band switching, in kit form. This kit features four-stage band switching in an extremely compact form. It operates on all bands from 80 to 10 Meters, inclusive, and embodies the latest principles of constructions and design. The exciter portion is built around a box-like chassis measuring only 17" long x 2¾" high x 3½" deep. The four 6L6 tubes, as well as the four fixed tuned exciter tanks are built along the rear edge rather than on the top, as is the usual practice. Band switching is accomplished by breaking the cathode circuits of the stages not being used and by connecting the link output circuit to the proper doubler stage. When the transmitter is completed, there are only two tuning controls to operate. All other adjustments are made when the transmitter is put into operation and then requires no further attention.

—30—

R. N. Seal of Acceptance
(*Continued from page* 24)

Seals previously awarded:

Consolidated Wire & Associated Corp. No. 100.0

Supreme Instruments Corp. No. 101.00-101.9

Triplett Electrical Instrument Co. No. 103.0-103.3

American Phenolic Corporation. No. 104.0-104.2

Solar Manufacturing Corp. No. 105.0-105.1

American Lava Corporation. No. 106.0

Electronic Manufacturing Engineers. No. 108.0

National Union Radio Corporation. No. 109.0

J. W. Miller Company. No. 110.0

—30—

The Video Reporter
(*Continued from page* 36)

put a set together if he faithfully follows the step-by-step instructions.

PHILCO, who previously showed television sets to dealers, will launch its line publicly in June. There have been reports that *Philco* has "something different" and this is borne out in the recent statement of Sayre M. Ramsdell which, in part, follows:

"These receivers will be entirely new in performance, appearance and developments. They will represent a marked advance in television, embodying improvements as yet unannounced.

"Television receivers will be sold to the public through radio dealers, whose experience and facilities, from both a merchandising and technical standpoint, make them an ideal medium on a nationwide basis. Television receivers can be sold on such a nationwide basis, but, as yet, television broadcasting cannot follow them and is limited to a handful of metropolitan centers. Television as an industry must wait for the broadcasters."

NEWSPAPER radio sections in the metropolitan area are giving unusually large space to *technical* television news. The newness of the art makes every advancement of general interest and editors were quick to sense the public's eagerness for such information.

One newspaper—*The New York Sun*—has featured a constructional series based on the *Andrea* kit. It appeared in four weekly parts and the response—judging by crowds which came—was tremendous.

ARE television prices too high? That's the question people are asking in New York. Just think back to radio's early days and you'll agree that they're not too high. At least not for the present stage of the game. Undoubtedly, prices will come down

with a mass public demand for receivers. And, judging by the high-quality of receivers and the excellent program service, it won't take long to interest the masses. Already, major manufacturers are heavily exploiting their wares. Full-page announcements have been appearing in New York newspapers. Department stores and radio dealers are featuring demonstrations. Best of all, television is getting word-of-mouth advertising that is most desirable, particularly because it is so favorable.

The ideal New York host is the fellow with a television set. You can bet your hat on that.

Twenty-five hours of programs a week are offered by *NBC*. Much of this total is devoted to film subjects. Such transmissions are largely for dealer demonstrations, but the choicer evening hours have excellent entertainment features, offering no repetition of program fare. —30—

Serviceman's Experiences

(*Continued from page* 24)

man, and that I frequently out-patienced *Job* in carrying some of the poorer members along with their payments. It's the truth—there's something about those people that makes you want to help them—something that tells you it's all right to deliver a repair without walking out of the house with a signed due bill in your pocket.

Good old Firp! My cup runneth over! —30—

QRD?

(*Continued from page* 30)

studying for 2nd class CW. Just what u think of the prospects for radio ops. . . . I mean good ops. Think by the time I get ticket will be able to do at least 40 wpm on mill. I started on this thing so will continue but wud like straight dope . . . MV. Ans.: There's always room for a good man in any profession but would truthfully suggest that you do more studying on material and equipment. Good men in this field are much scarcer. But gud luk, OM.

WE note with much pleasure *CTU-MARDIV*'s report that shipping has improved in the last few weeks. They state a number of shipping lines, under contract to them, have placed their laid up ships into active service. Men are being lined up for duty on the vessels to be placed in the cruised services now. So it looks like some of the boys will begin eating regularly again. And good luck, sez we. So with 73 . . . ge . . . GY. —30—

High Fidelity Remote

(*Continued from page* 29)

small mica by-pass condensers keep this frequency out of the audio section and out of the 25L6 oscillator as shown. Volume control is provided by a half-megohm potentiometer which also acts as the load for the diode section of the 75 tube. The automatic volume control voltage is also taken from here after suitable decoupling with the one-tenth megohm resistor.

All leads should be as short and direct as possible, with a conscious attempt to keep the transmitting oscillator (25L6) parts and wires away from the rest. This really becomes important at only one frequency (provided 1575 kc. has been chosen) and that is when the unit is tuned to a broadcast signal of 1120 kilocycles. At this frequency the 6A7 oscillator, since it runs 455 kc. higher than the signal, will beat if proper care is not taken.

In the set-up shown, the primary of the r.f. coil with the series mica condenser has been chosen to act as a trap at this frequency of 1575 kilocycles. If the constants of the parts used to build the unit do not stack up in this fashion, an ordinary wave trap (coil and condenser in parallel) can be added to the primary circuit.

When the unit has been completely

wired, then given a preliminary test for shorts and then plugged into the line, the first step should be a check of all bias and plate voltages. These are orthodox and can be gauged from experience.

The next step is alignment of the receiver portion. For this a standard service signal generator or oscillator putting out a 455 kc. modulated signal will be needed, together with a pair of high-resistance headphones. The headphones are connected from grid to ground of the 25L6 tube, the volume control is opened wide, and the signal generator is connected to the point marked "A." The intermediate frequency transformer is tuned until the best signal is heard in the headphones. (Be sure that the variable condenser is in such a position that no beat will be caused by its oscillator section.)

The headphones are left in position, the signal generator is removed, and the unit is now set to cover the broadcast band. This is done by turning the variable condenser to the open position and adjusting the trimmers on it until a station at the top of the band is heard best. Then, with the variable closed padder marked "C" is adjusted until a station at the bottom of the band is heard best. These two operations are repeated until all broadcast stations are heard to best advantage. The phones are then disconnected.

The transmitting oscillator is now tuned. This is done in conjunction with the receiver with which the unit is to be used. Set the receiver at 1575 kilocycles. (The highest broadcast station is at 1550 kc. and the setting will be just a shade above that.) Then adjust the tuning trimmer marked "E" until the carrier is heard best in the receiver. That's all there is to it!

In push-button tuned receivers, it might be a good idea to use one of the buttons for this frequency of 1575 kilocycles. The receiver can then be set for remote operation merely by pushing this button.

To use this compact, high fidelity remote control unit, the receiver is turned on and tuned to 1575 kilocycles. The volume control is left generously open. (This control merely determines the maximum volume permissible and is therefore not critical.) The remote unit is then plugged in at the easy chair and any station tuned in. Volume is under complete remote control, from zero to maximum. —30—

12 Watt Amplifier

(*Continued from page* 19)

the use of a phase inverter tube to be superior to all other methods of phase inversion, from the standpoint of both cost and frequency response. Two standard phase inverter circuits were available, shown in Figs. 3 and 4. The first circuit, using a double triode tube such as the 6N7 or 79, consists of two successive amplifier stages, with the input of the second stage monitored down so as to make its voltage output equal to that of the first stage. All tubes acting as amplifiers are essentially phase inverters, since the grid voltage swings are 180 degrees out of phase with the plate voltage swings. By connecting the output of the first stage to one push-pull grid at point A, Fig. 3, and interposing a second stage between the first push-pull grid and the second, the voltages at these grids are made to differ in phase by 180 degrees. The relative amplitudes of these voltages are controlled by the position of the tap on R1. There are two chief disadvantages to this circuit: (1). The possibility of unequal voltage output of the two triodes due to possible non-uniformity of the triodes, which can not be readily detected by the builder. The result is much distortion at high outputs. (2). Any distortion introduced by one triode is not necessarily of the same type or magnitude as that introduced by the other triode. The result is a distortion which can not be cancelled by virtue of the push-pull connection.

These disadvantages are completely eliminated in the circuit shown in Fig. 4. The equal-and-out-of-phase signal voltages are developed in the plate and cathode circuits of a single triode. The circuit operates as follows: consider first, no signal voltage being applied to the grid. The d.c. bias on the grid holds the plate current to some definite value. This plate current is flowing through R1, and produces a voltage drop, end B being negative with respect to end A. Since the cathode supplies the plate current, the same current flowing in R2 produces a voltage drop, end D being positive with respect to end C. In R1-R2, the voltage drops in the two resistors are equal. Now consider a signal voltage applied to the grid, and during the first instant of the cycle, the grid swings, say, in a negative direction. This action reduces the number of electrons reaching the plate, and reduces the current through R1. Therefore, because the voltage drop across R1 decreases, end B becomes less negative with respect to A, which is the same thing as saying B becomes more positive with respect to A. Thus, when the grid voltage swings negative, the plate voltage swings positive. However, the reverse takes place in the cathode circuit. Because of the smaller drop across R2 due to the grid's negative swing, end D becomes less positive (more negative) with respect to end C. Thus when the plate swings positive, the cathode swings negative, and vice versa, and the voltage variations at E and F are always exactly 180 degrees out of phase. Because the plate current is at every instant equal to the cathode current, and R1-R2, the voltages at E and F are equal, and the equality and distortion are completely independent of the tube's condition. Any distortion introduced into the plate circuit will likewise be introduced into the cathode circuit, and the even harmonics will cancel out in the plate circuit of the

push-pull tubes. This circuit permits the use of a high grid bias, low mu type of tube which is capable of taking large signal voltages with little hum and distortion. All of the available double triodes for the circuit in Fig. 3 are of the low bias, high mu type, another point in favor of the Fig. 4 circuit.

R3 supplies the necessary grid bias, while grid leak R4 is returned to the point just below the bias resistor instead of to ground, in order to maintain the proper bias. Attention is called particularly to the latter statement, because five times out of ten, the builder will unthinkingly return this end to ground, even if he knows the circuit. Such a connection would change the bias to a value sufficient to reduce the volume to almost nothing.

The output transformer for the 6L6's was intended by the manufacturer for use with a pair of 2A3's or 6A3's, having a primary load impedance of 5000 ohms and a current rating of 60 milliamps, in each leg. By coincidence, this is exactly the requirements for a pair of 6L6's with 250 volts per plate. This transformer uses a high permeability type of core which saturates for comparatively low values of magnetizing force. So long as the d.c. plate currents in both halves of the primary are equal, the magnetizing force on the core is zero. However, if the difference is 5 milliamps, or more, the core saturation is sufficient to cause attenuation of low frequencies. The writer checked a pair of newly purchased 6L6's by operating them under identical conditions, and measuring their plate currents. Even though both tubes were in perfect condition, their difference in plate current was NO *less than 14 milliamps!* This is particularly liable to happen in tubes having a high transconductance, like the 6L6, 25L6, and 2A3, due to imperfect uniformity in manufacturing. Besides the loss in frequency response, such a difference in plate current would cause hum and distortion, so it became necessary to provide a grid bias adjusting circuit in order to make the plate currents equal. The circuit is shown in Fig. 5. The bias adjustment proceeds as follows: connect a low range, high resistance d.c. voltmeter across the plates of the output tubes. If the tube plate currents are not exactly equal, the meter will give a reading equal to the difference in the voltage drops between both halves of the transformer primary, assuming equal resistances in each leg of the primary. The voltmeter pointer may initially deflect the wrong way; in that case merely reverse the voltmeter leads. Now adjust the potentiometer arm until the meter reads zero.

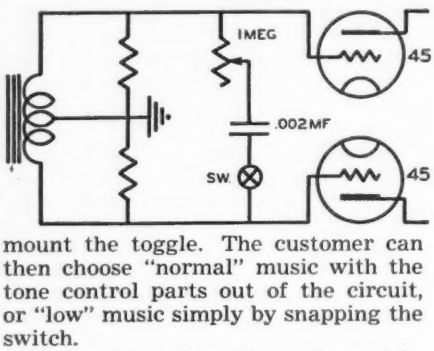
Suppose the arm of the potentiometer R5, Fig. 5, were initially set at the exact mid-position. Then resistance OAC-OBC and the current flow in these sections are equal, making the potentials at A and B equal. Thus, there is no difference in bias on the tubes T1 and T2. With the adjustment carried out, suppose the arm of the potentiometer had been moved all the way to end A, in order to make the plate currents equal. Resistance OBA is now much larger than OA, so that more current will flow through OA than OB. Hence, a larger voltage drop will exist across OA than OB, and the bias on T2 is then more negative than that on T1 by several volts. By moving the arm of the potentiometer toward end B, the grid of T1 likewise becomes negative to that of T2. The values of resistances have been chosen to make possible a plate current variation of about 20 milliamps for each tube, which will take care of wide deviations of the tubes from the average.

No by-pass condenser is necessary across R20, Fig. 1, since the grid signal voltages are necessarily exactly equal, as explained in the discussion on phase inverters. The distortion at maximum output is so small as to make the application of inverse feedback to the amplifier totally unnecessary.

Bench Notes

(*Continued from page* 17)

job, or deliver the chassis with a toggle already connected at the point shown on the diagram. By replacing the variable resistor with a fixed one, the screwdriver hole may be used to



mount the toggle. The customer can then choose "normal" music with the tone control parts out of the circuit, or "low" music simply by snapping the switch.

On the *45* combination—where pick-up gain is at a premium—the set owner usually prefers the "on" setting for broadcast music, but likes the apparently higher speaker output on "phono" which an unhampered output stage allows when the switch is "off." Let the customer listen to various resistor values below 1 megohm before soldering in a permanent one; the object, of course, is to give him a choice between two settings he likes. In the combination, mount the toggle on the phono platform, where it is most accessible when he switches to records.

The original hidden screw-driver tone adjustment was designed during a period when manufacturers had the idea that any tone control distorted music below the optimum quality permitted by the remaining design. The fashion has changed, and the customer appreciates your putting quality control into his hands.

Accounting for Tastes

THE acceptance of the modern front-panel tone control is proof that the preferences of listeners vary widely with regard to tone quality. Because the appeal tone quality has for any listener is dependent upon his *emotional* response, it is impossible to set up an analytical standard. Tone quality is neither good nor bad, but thinking makes it so. Each man's opinion is his reference standard; all we servicemen can do is to help the customer get what pleases him most, whether or not we agree with his choice. He is the one who is to be entertained by his own set, and his emotional response is the only one which should concern us.

Aside from these personal reactions of the set owner, the problem of faithful or ideal reproduction is too complex for any single acoustical engineer, design engineer or serviceman to solve. This does not imply that a repairman's ear is useless when a cathode resistor goes out for a walk; it does mean, however, that during shop work we should compare quality only with the original, instead of getting cluttered up with a bunch of abstract sciences concerning psychology, console shapes, auditory perspective, and room furniture. Restore the set electrically, using the manufacturer's specifications as the norm. The customer bought the set because he liked its original tone quality, and he will like it again if you give it to him again. Further changes depend upon his choice, not yours.

Returning to the personal angle: most women dislike receiver quality in which the higher frequency range is accented—even for speech, which depends mostly upon the upper range for intelligibility. Many men have no preference; most of them consider the higher frequencies desirable in speech, but aren't fussy about the range on music. A radio technician usually mistakes fidelity at the low and high ends —regardless of the middle distortion— for good quality; the reason being that he probably appraises quality in terms of the circuit design which produces it. If full-bodied highs and lows are coincident, there is usually some good design engineering behind it. Don't argue with a musician—musical training frequently biases a listener away from the ideal of quality which a radio man sets for himself. Don't ask me why. Practically everybody prefers a reduced frequency range to a longer one which has some frequency distortion.

There are exceptions, of course—I know from experience, though, that when you give the customer the quality he wants, you've made a friend.

Facsimile—Home News

(*Continued from page* 10)

These impulses are transmitted as audio signals over the regular station carrier.

In reception, the simplicity and inexpensiveness of the *Reado* printer is due primarily to the phenomenal ability of the *Reado* paper (available from any Crosley dealer) to turn black or some shade of gray as the small current emanating from the stylus point passes through this paper.

The paper feeds through the machine at the rate of 1/100 inch per second, which means that three feet of copy should be received from the usual hour broadcast from stations using the *Finch* system of facsimile.

Two small coils mounted on the left side of the printer which actuate the small pawl to release the clutch, make possible the synchronization of the printer and scanner at the beginning of each stroke. Synchronizing impulses are sent out with the facsimile picture itself.

The Crosley 758 Receiver used with the *Reado* in the field test, is a high-grade, seven tube, superheterodyne radio receiver. It has the additional features of an extremely good automatic volume control system plus provisions for the time clock above mentioned. The automatic volume control permits the obtaining of the desired degree of blackness of print on any station and receives that same degree of intensity on any other station that you might receive facsimile broadcasting.

There does not seem to be any doubt but that within a short time facsimile will become as usual and commonplace in the home as is the morning newspaper today, although it is not believed it will ever quite supplant it.

Incidentally, the *Reado* can be used with any receiver which will tune to the transmitting station accurately.

Facsimile opens up a new field for the experimenter in the matter of reception and at present tests are being undergone to determine the greatest DX at which it is possible to obtain good copy.

U. H. F. Transmitter

(*Continued from page* 15)

cuit is out of tune. A resistance is cut in on the primary side of the plate transformer to reduce the plate voltage on these tubes when tuning up. Further protection of these tubes is provided by placing fuses in the buffer and final plate leads.

Transmitters which function well on the lower frequencies cannot be expected to be efficient on these frequencies by simply changing coils. Losses which are insignificant on the lower frequencies multiply themselves manyfold on these frequencies.

A small auxiliary r.f. unit such as the one described operated from the available power supply and modulator would be a more desirable setup. —30—

Sight & Sound News

(*Continued from page* 36)

continuously downward before a scanning aperture and lens system and then causing an electronic scanning beam to move upward at exactly the same speed so that a stationary electronic image results. A slotted rotating disc is placed between the film and a number of lens segments. This acts as a shutter and gives light to only one of the segments at a time. The result is that sixty separate stationary frames per second can be produced from film which was originally photographed at 24 frames per second, although the speed of action on the receiving screen is not changed in the least. —30—

As I See It

(*Continued from page* 16)

to superheterodynes and who no doubt will advance to the frequency-modulated systems when they come in and who will install facsimile receivers when they are available for general sale.

It is true that we have a certain type of specialization present in the radio service industry, viz. the auto-radio shop in contrast to the home broadcast receiver shop. And why this specialization? Primarily because of the automobile and not the radio receiver. Auto-radio servicing naturally gravitated to that man who had proper parking facilities for the automobile during the time that the receiver was being installed or being removed. Also the type of man who decided upon auto-radio installation and service was that individual who had made contacts with auto dealers and who possessed the proper equipment required for the installation. As a matter of fact the service came as a consequence of the installation. It is of further interest to learn that in many places the majority of service men, because of lack of parking, drilling and other installation facilities, suggested that their customers go to "so and so" who specialized in auto-radio installation and service. The specialization in this field is found more in *installation* than in *service*.

Summarizing, we can come to but one conclusion concerning television receiver servicing. Gather whatever data you can. Acquire the maximum

amount of knowledge so that when that day comes, you will be ready—but in planning the future, do not contemplate becoming a specialist. Make television receivers just another of the radio communication systems which are within your province of activity.

Reducing Service Charges?

A QUESTION has been proposed and we shall attempt to answer it despite the fact that without doubt some people will misconstrue what is being said and raise a clamor that we are advocating something which is contrary to the best interests of the entire radio servicing industry.

The question is *"Should a service shop operator who, by employing some new technique, increases his operating capacity, reduce his service charges in order to get more business?*

We assume that the correspondent means that the change in technique makes it possible to service more receivers in a working day and that since the number of receivers on hand each day is not sufficient to occupy the entire day, that several hours are now made available. A snap answer, based upon purely business principles would be to the affirmative, because increasing the operating capacity of any establishment without increasing operating costs to the same extent is the equivalent of reducing the cost per job. If the cost per job is reduced, then the service charge can be reduced. However, we are not prone to make snap answers in a field such as radio servicing because operating conditions are not the same all over the United States. Therefore we find it imperative to qualify the answer.

In the first place, the location of the shop is important with respect to competition and the number of possible customers. If the shop is so situated that competition is not a vital factor—and there are such shops in the country; and further, the possible number of customers likewise are limited, then we say that increasing the operating capacity should not result in a reduced charge. This is not a suggestion to take advantage of the customer, because if he secures his money's worth, he is satisfied.

At the same time, since the maximum number of radio service customers are limited, you are justified in wondering if there is any value in increasing the operating capacity—if there is any saving in the operating costs. Increasing the operating capacity without a comparable increase in operating costs always is worthwhile, because it provides time which can be converted to good advantage in any one of a number of ways.

If a service shop occupied all day with radio service can increase its operating capacity so that the work can be done in half the time, the afternoon then is available for expansion operations—the cultivation of set sales, tube sales, electrical appliance service, etc. If this is accomplished, then the increase in operating capacity is the equivalent of having reduced the operating cost per job and it is entirely up to the owner of the shop to analyze his market and establish if it is necessary to reduce the service charge. Increasing operating capacity, if only to provide leisure time to keep abreast of developments in the field by reading and study is justified and if it can be done without decreasing the service charge so that the full profit is earned in half the time previously spent, all things favorable have been accomplished.

In the case of the service shop located in a community where increasing the operating capacity will make it possible to handle more service and the customers are available, reduction of the service charge is entirely in order—providing, however, that the charge being made, after reduction is still profitable. This reduction in price based upon quantity is a fundamental factor in all business. It is not the equivalent of a cut price, for it is based entirely upon operating cost. After all is said and done, there is more profit in handling five jobs per day at $5.00 per job, than three jobs per day at $6.00 per job, providing that these charges are in line with the costs and show the required percentage of profit.

Naturally we are not suggesting that this decrease in price be in direct proportion to the saving effected by the increase in operating capacity. It should be no more than the amount required to offer some attraction to the customer and in deciding upon this reduction the service station owner is the sole judge. If a reduction in price—yet profitable operation—can attract more customers—the man who thinks twice about making the change does not belong in business—because he is operating along lines contrary to normal business.

Please bear in mind that what we say is not predicated upon any one particular service charge. It applies to all service charges—but it is predicated on the condition that reducing the service charge will be productive of more work.

The man who is confronted with competition, as for example in a large community where the operating area always can be increased and the roster of customers is limited solely by his own efforts, finds a reduction in operating costs of great importance. It is the most logical means of meeting and beating competition—but once again the man must be certain that he can get the added business.

Now, after having cited all of these possible conditions, we conclude with the suggestion that the only time the price should be reduced, no matter how much the operating capacity has been increased, is when it is absolutely necessary. No one ever went to heaven because he gave up some of his profits providing, of course, that the profits were not exorbitant. If you are getting a fair profit—keep on getting it as long as you can. —30—

Easy to See
(*Continued from page* 39)

common—an electron gun to create a fine stream of electrons, a grid element on which the bias may be varied to control the strength of the electronic beam, and a luminescent screen on which the beam impinges with varying intensity to produce a picture.

Tubes are made in such a way that either (1) the beam is deflected electromagnetically, by coils in a yoke slipped over the neck of the tube, or (2) it is bent from its normal course electrostatically by electric fields produced between pairs of parallel plates built into the tube itself.

These tubes, in the 3" and 5" sizes, are *usually* built for electrostatic deflection, although one or two 5" tubes for use with a yoke are on the market. When a 9" screen is to be scanned, the various makers differ about evenly as to which deflection method is preferable, and 9" tubes for either scanning system are available. At 12" and up, all makers but one seem to feel that electromagnetic scanning has advantages; DuMont builds 14" tubes with inbuilt plates for electrostatic scanning.

In any of these tubes, it is the "Anode No. 2" or accelerating voltage that determines the brilliance of the picture on the screen. You will note, in the data pamphlets on cathode ray tubes, that a range of possible "Anode No. 2" potentials is given; for the RCA 906-P4, one can use anywhere from 600 to 1500 volts, while for the type 1800 Kinescope, any voltage from 3000 to 6000 is permissible. One should not too quickly jump to the conclusion that he will use the top voltage, because not only will the "Anode No. 2" power supply cost more, but the other voltages go up also.

For the little 906-P4 at higher accelerating voltages, the "Anode No. 1" potentials climb from 170 to 475 volts and deflection-tube plate circuits require as much as 700 volts. What power supplies do you have around, or what can you purchase at a price within your means? In the case of the C-R tube type 1800, the "Anode No. 1" potentials are listed at 625 to 1250—quite a difference in power supply cost. For a given dollar expenditure it boils down to whether you wish a large tube with a none-too-brilliant picture or a smaller tube with vivid, intense picture.

The DuMont engineers have developed an interesting 5" tube called the 54-11-T which adds to the acceleration of the beam *after* deflection and which permits a somewhat lower total power supply cost with 4000 volts for brilliance. This is done by adding an "intensifier" ring around the wide end of the tube near the screen. Two thousand volts is applied to their "Anode No. 2," 4000 volts at the intensifier, yet only 500 at the "Anode No. 1." All of these voltages are obtained from a unique hook-up involving a 1500-volt transformer, a pair of 2Y2 rectifier tubes, and a resistance-capacity filter. The independent power supply source, supplying the rest of the receiver, need furnish but 400 volts to the plates of the deflecting tubes.

Getting into the principles involved in sweep circuits, it is well to point out, first, that we must, for horizontal scan, draw the beam at an even speed across the screen, from left to right, in about 85% of 1/13230th second, and then quickly push it back in the other 15%. The vertical scan requires our pulling the beam downward, at an even speed, in 93% of 1/60th second and then returning it to the top edge of the picture in about 7% of 1/60th second. The best way to visualize sweep energy is that shown in Figure 50A; for electromagnetic deflection (yoke) this would indicate *current* flowing in the coils, while, for electrostatic deflection, this represents *potential* across a pair of plates within the neck of the tube. Here "T" represents one line or one field, while "ts" is the useful scanning time, and "tr" is the return or flyback. It is important that "ts" be linear (a straight line) for even spread of picture; a curved line here would result in uneven distribution of the picture on the screen.

For satisfactory deflection by either method, our sweep circuits must include the three tube functions shown in Figure 51. These functions may be a bit hidden in some sweep line-ups, but, on careful examination, it will be found that (1) an oscillatory circuit is

provided, (2) a discharge or other circuit wherein control of wave form is possible, and (3) an output amplifier for final wave form shaping, before delivery to deflecting coils or plates.

Considering now only electromagnetic scanning, we find that to produce a current in a pair of deflection coils which will have a shape such as that of Figure 50A, we must provide a voltage having the shape illustrated in Figure 50B. This is made necessary by the combined effect of output tube impedance, and coil inductance and resistance. For *horizontal* deflection it is usual to use, as Output Amplifier, either a pair of pentodes such as the 6F6, or a single beam power amplifier, such as the 6L6. The current provided by the Output Amplifier must be sufficient to produce the required number of ampere turns without causing distortion of the sawtooth current wave due to grid or plate circuit overloading. The current supplied *to the grid* of this amplifier is essentially sawtooth in nature (Figure 50A).

For vertical deflection, the 6C5 seems to be the unanimous choice as an output amplifier. It is a low-current, voltage amplifier triode, and to its grid we must supply a current containing both sawtooth and impulse components, closely resembling Figure 50B.

Referring now to Figure 52, which is the schematic of a set of modern electromagnetic sweep circuits, some comment on the transformers coupling Output Amplifiers to the coils of the tube yoke is in order. That in the horizontal output circuit is a high ratio, step-down transformer capable of evenly passing 13 kc. to 130 kc. A sawtooth wave form contains a number of high harmonics, and it is necessary to preserve the relative amplitude and phase relationship of at least ten to maintain the original wave form; hence the necessity of uniformly amplifying 13,000 cycles to 130,000 cycles. The auto transformer coupling Vertical Output to yoke is a low ratio, step-down designed to evenly pass 60 cycles to 600 cycles.

A type 1-v rectifier tube will be noted in the output of the horizontal deflection circuits. Because of the considerably lower plate resistance and the slower repetition rate in the vertical deflection output circuit, such a tube is unnecessary. This "damper" is desirable where shown because of transients set up as a result of the *sudden change* in the Horizontal Output tube's plate voltage, from its high retrace value to its lower scanning period value. The 1-v acts as a switch to remove the load during return or retrace time and return it during scanning periods.

In the circuits of Figure 52, the oscillator and discharge functions for each deflection system have been combined in a single dual-purpose tube, a 6N7 double-triode. The action in the discharge tube circuits of the *vertical* deflection system, to produce a wave form such as Figure 50B is as follows. With the grid G maintained at cut-off, condenser C is charged (from the B power supply) through resistors R and R1, and it is this steadily increasing voltage which produces the scan period "ts" in Figure 50B. When *a timed impulse from the oscillator* hits G, the grid is driven to zero bias, held there a definite length of time while the condenser C discharges, the straight-drop portion of "tr" is first produced, then the rest of "tr," and, when the pulse is removed, the grid bias returns the grid to cutoff.

The presence of the resistor R2, in series with C, accounts for the unusual wave shape of "tr" in Figure 50B. In the *horizontal* discharge circuit you will note there is no resistor equivalent to R2 and the result is that a sawtooth voltage resembling Figure 50A is supplied to the Horizontal Output tube's grid.

Since a Frequency Separator supplies properly timed impulses, very similar to those which an oscillator can supply to a discharge tube, one might question the need of having an Impulse Generator at all. Why not feed the pulses from the Frequency Separator directly to the discharge tubes? It was stated in the previous paragraph that the action for each cycle of operation *is initiated* by a timed pulse from the oscillator. If there were no signal, there could be no discharge; thus one could not adjust sweep circuits unless there was a program on the air, and, perhaps more important, the beam in the Kinescope would be stationary near the center of the screen until sync pulses reached the discharge tubes, which would probably burn and injure the fluorescent material of which the screen is made.

The action of the oscillator, which in this case is of the "blocking" type, is this (see Figure 53). During the first half-cycle of oscillation ("tr"), grid current flows and builds up a bias on the grid condenser large enough to drive the tube well beyond cutoff. The grid condenser now slowly discharges ("ts") through its resistor until the bias gets back to cutoff, the grid unblocks, a pulse is released to the Discharge Tube, grid current flows, and the action repeats.

Synchronization is accomplished by applying the sync pulse just before the return of bias to cutoff. The variable factors provided permit (1) adjustment of the *duration* of the pulse supplied to the discharge tube, and (2) adjustment of the *frequency*, so that it would *normally* be just a finely-split second slower than the frequency of the incoming sync pulses.

Taking up *electrostatic* scanning, it should be explained first that any of several types of oscillators may be used for either electromagnetic or electrostatic scanning—likewise either gas tube discharge circuits or vacuum tube discharge circuits. In Figure 54 a type 884 gas tube is used for the Impulse Generator and Discharge functions, but the 6N7's of Figure 52 could be used here just as effectively, and type 884's could be used in Figure 52. Whether one uses a vacuum tube

for the Impulse Generator and Discharge functions, or a gas tube, is purely a matter of personal opinion, parts lying around, and one's pocketbook. In Figure 54, the 884 gas tube is used merely to show its application; for the same reason a push-pull Output Amplifier is used which would be suitable for use on an 1802-P4 Kinescope, the 54-11-T Teletron, or any CR tube having its four deflection plates brought out to separate terminals.

In Figure 54, only one deflection system is shown, that for Vertical Deflection, as the circuits for Horizontal Deflection would be practically the same, with the exception of a couple of resistor and condenser values in the gas tube's output hook-up. In operation of the type 884 gas tube, condenser C is charged through resistors R and R1, producing the "ts" period of Figure 50A. Finally a potential is reached which is the tube's breakdown point as determined by the grid bias on the tube. The charge on C is dissipated through the low impedance of the tube, created when grid control was lost. This potential drops to ("tr" period) the point where the grid bias resumes control and charging of C is resumed. The resistor R3 is used to slow down the discharge speed, as, without it, there would be insufficient "tr" or flyback time.

Since more negative bias increases the breakdown potential, and less bias reduces it, synchronization is accomplished by feeding positive pulses to the 884's grid just before the breakdown potential is reached in the plate circuit, which drops the breakdown point and causes discharges at the repetition speed of the sync pulses. As a rule, the output of an 884 is not perfectly linear sawtooth waves, but this is corrected in the Output Amplifier by adjustment of the cathode resistor R2.

Personally, I prefer push-pull deflection to the single-ended connections, for a number of reasons, most important of which is that 300 volts is sufficient on the Output Amplifier tubes, even with 2000 volts on the 2nd Anode of the picture tube. Also, good focus and linearity are more easily attained. As shown in Figure 54, the two units of the 6N7 are so connected that each is a resistance-coupled amplifier, while the second is a phase inverter whose sawtooth output voltages are 180 degrees out of phase with the similar potentials of the first unit.

In closing this series of articles, which, taken as whole, form a condensed course in television, I wish to express the hope that the amateur op readers in particular have found my explanations of value. Amateurs have pioneered many new developments in radio communication and there is every reason to believe that they can play an important part in refining television transmission and reception, once they get into it. While television is considerably more complex than was radio from 1910 to 1930, the amateur of today is far more advanced in average age, theory of operation and practical knowledge than were the small handful of us that did "cut and try" research in the early days of radio. Many an amateur has constructed, purchased or otherwise acquired excellent test and checking equipment, and, with the insatiable curiosity and urge of the true experimenter, can make both a name and high figure income for himself in television.

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-30-

Three Necessities of Radio
(*Continued from page* 33)

pair of trousers. We do not think of these small "trifles" when first we begin practice, but we invent as we go along.

IT is handy to learn to be handy, for then we learn the need of organization when we must "tear the drawers apart" to search after a needed size bolt, screw or nut. An indexed "high-boy" or storage stand makes for elimination of such worries. It stands 5' high, and is wide enough to hold two tiers of cigar boxes. It is 8" deep. The mantel on top could hold a small radio or books or even a spare battery. It surely clears the floor space and after a while, we begin filling in the walls with more of such high-boy units, for holding tubes, and who-knows-how-much other small stuff.

I COME to my third improvisation, which I prize very much. In trying out battery-operated sets on the table, I've had to clutter up the whole table with the set, the speaker, the tester and meters, *plus* the unsightly mess of the batteries. Yes, I've done that so many times that finally I said to myself, let's have a light on this problem, and soon I made myself the candelabra illustrated in Figure 4.

This "candelabra" is just a handle 8" long by 1½" in diameter screwed to a circular base 6" in diameter by 1½" thick. Turned pieces of redwood, shellacked, are used. The top is a 4" square of bakelite with at least six to a dozen binding posts. These are labeled in volts (plus and minus) for "A," "B" and "C" power supply. Each post is the end of a lamp cord, six feet long, color-coded. This candelabra can stand on the table, easily set out of harm's way and fool-proof. –30–

50 Watt All-Band Xmtr
(*Continued from page* 32)

means of the Excitation Control to the proper value, 3 to 5 ma., or perhaps slightly more for the higher frequencies. The Tune-CW-PH switch is now thrown to the c. w. position actuating relay Re_2, turning on the 500 volt supply, and the red pilot light and the final tank condenser is now rapidly tuned to resonance. Non-resonant magnitudes of plate current should not be allowed to flow for more than a second or so. The 807 should be given a few seconds to cool between surges until the resonance point is located. The antenna may then be coupled until the 807 draws rated plate current, 90-100 ma. The key jack is located in the rear of the cabinet. For c. w. operation, the filaments of the a.f. tubes are cold, plate voltage is not applied to them and the modulation transformer's secondary is shorted.

For Phone operation, with the 807 coupled up to full load into the antenna, the Send-Receive switch in the "Receive" position, turn the Tune-CW-PH switch to the "PH" position. Heater current now flows in the a.f. tubes, and the modulation transformer's short is removed. The microphone jack is located in the back of the chassis next to the key jack. Any of the usual crystal mikes may be used.

In constructing the transmitter, be sure to bond all the grounds. With so much material in such a small space (the transmitter chassis is only 8" x 15" x 2½" with a panel 8¾" x 16¾") it is necessary to use plenty of care and foresight to avoid a tangled confusion of parts. –30–

RADIO NEWS 1940 Xmtr
(*Continued from page* 9)

relays open and close and is not an indication of poor performance.

The two smaller autoformers which are used in connection with the 150 and 350 watt converters (Stancor & U.T.C. make respectively) are mounted on the side of the cabinet directly in back of the relay control box. The taps are fed by means of cable to the switches (Ohmite) which are located on the control panel.

The amateur operator has been slow to follow the safety rules as recommended and used by commercial manufacturers. A line switch called an "interlock" is used to break the primary circuit as it enters the transmitter. When the rear door is open voltage cannot (*Next page, please*)

be applied to the transmitter and the use of such a device is recommended in all cases. This switch should be heavy enough to carry the total current drawn to the transmitter-receiver.

DETAILS

Main Power Supply

This unit presented no problems in construction as the shelf normally supplied for use with the cabinet (Parmetal) was used as the chassis to mount all of the parts used in the two supplies which furnish plate voltage to the modulator and to the Class C amplifier. This shelf was first marked for unit location, after which it was removed and placed on the bench where the construction was done with the least possible effort. It is important that everything be "tied down" securely and the liberal use of lock washers will insure the builder that vibrations coming from the speaker or generator will not loosen the nuts used to mount the parts. Much thought was given to the electrical design of this unit in order that high efficiency would be obtained with respect to the current drawn by the rectifiers and associated equipment.

Examination of the tube tables revealed that the Taylor 866 Jr. rectifiers would supply the voltage and current required by the Type T55 Class C amplifier and the TZ40 modulators. These tubes have a filament rating of 2½ volts at 2½ amperes each while the standard 866 rectifier requires just twice the current or 2½ volts at 5 amperes. Remember that every watt consumed means a sacrifice of some other piece of equipment which might give us that feature we have always wanted.

Choke input filter is used in both the modulator and final power supply in order to insure adequate regulation so important to good operation, particularly when Class B audio is used.

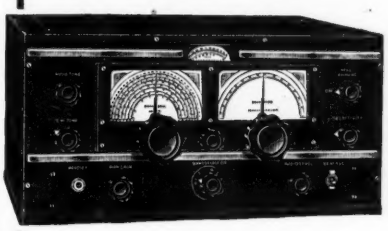
As a safety precaution the bleeder resistors (Ohmite), high voltage condensers (Aerovox) and high tension terminals from the high voltage transformers are located toward the front of the assembly. The rectifier filaments are wired with Number 14 tinned copper wire over which thick-walled spaghetti tubing is placed, and the plate leads are wired with auto ignition cable. The Aerovox filter condensers are rated at 2000 DCWV.

The sockets for the rectifiers should also be chosen with care and the types used have their plate terminals located through the bottom whereas the standard high voltage rectifier has a plate cap which is well removed from the associated filament pins. The writers selected an all-ceramic type of socket with large heavy contacts so that no voltage drop would occur from faulty contact.

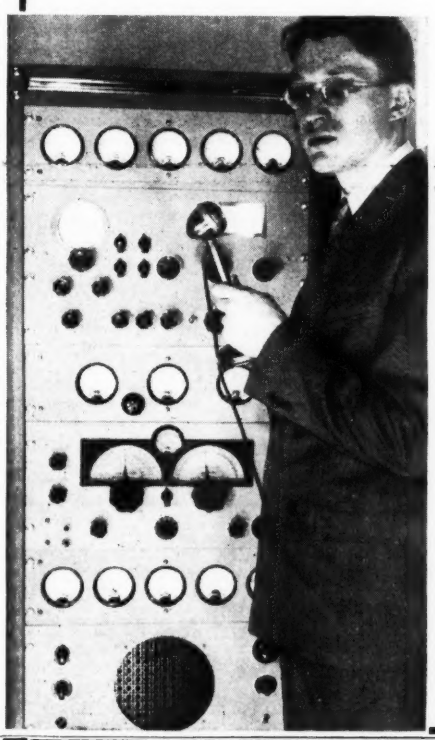
The bleeder resistor should be rated at 100 watts or more in order that the heat dissipation be kept at a minimum.

The mounting holes for the two plate transformers (Stancor) are first laid out and drilled on the bench and the actual wiring is made to the two units. Before installing the complete power supply within the cabinet the two transformers are removed to permit easier handling of the unit as it is put in place. It is then a simple matter to reassemble the two units and reconnect them. Mounted on brackets on the rear of this unit will be seen a group of screw type terminals. All connections to the power supply are made at this point. Identifications of the terminals should be jotted down and fastened to the schematic as the construction progresses so that little difficulty will be had in locating these terminals when the final wiring takes place. Both sections of this dual supply furnish a plate potential of 1000 volts and terminate at the two stand-off insulators to right and left as shown in the illustration.

Directly ahead of the above assembly will be seen a speaker which mounts on its own panel. This speaker is connected by means of cable to the receiver deck and inasmuch as it is of the P. M. type it will require no field excitation. To the left of the speaker grill facing the front will be seen a standard telephone hand set together with its cradle. Reference to the schematic diagram will show that as the W.E. hand set is removed from the cradle a series of operations takes place as mentioned in earlier paragraphs. The associated manual controls used in connection with the hand set are grouped on this



Below is a picture of the new marine combination transmitter-receiver unit described in this issue of Radio News. The gentleman admiring the rig is Mr. E. P. Kelly, W9HPW, a ham well known for his low power DX record.



same panel where they are accessible to the operator. Inasmuch as the main audio nerve center should be kept within its own boundaries, the controls for the speech amplifier and the RADIO NEWS Vox System are brought down through shielded cable to this panel. By following this procedure it will be apparent to the operator that all controls related with the speech input circuits are confined to one specific unit.

Above the speaker panel is mounted a standard 5-hole meter assembly. We believe that one of the nicest features of this transmitter is the manner in which the meters are mounted, not only from the standpoint of assembly but also that the final appearance is greatly enhanced by situating the meter flanges in back of the cut-outs rather than in front as is normally used. To do this we took a strip of 3/16" bakelite panel and cut it to a length slightly in excess of that required for the meters. This strip may be about 4" wide and should be laid out in connection with the panel on the work bench. The actual location of the mounting holes will depend upon the make of meters used.

All of the meters shown in the illustration are Triplett 3½" flange-type bakelite-cased instruments. The terminals for these particular meters are located ⅛" below center and in laying out the strip the constructor must allow for the ⅛" difference between the center line of the panels and the line drawn on the bakelite strip to locate the terminal holes.

The two hex nuts on each terminal of each meter are removed, being careful not to shake or otherwise jar the instrument. They are then reassembled with the bakelite strip replacing the first hex nut. One nut is used to mount each terminal onto the bakelite after which soldering lugs should be used for all connections. The complete assembly is secured to the meter panel by means of 2½" round head machine screws with extra hex nuts used to space the bakelite at the proper distance from the meter panel.

The multiplying resistors which are used in conjunction with the plate voltmeter are mounted directly onto the bakelite strip. This provides both a substantial and efficient means of mounting. All of the connecting leads to the various meters are carefully tied together and the completed cable clamped to one of the assembly bolts.

MODULATOR UNIT

The choice of modulators, of course, depends upon the R.F. input to the final amplifier of any transmitter. The choice of tubes for the modulator unit used within this transmitter are of those requiring low grid drive together with large audio outputs and ones which will operate with no bias supply. A pair of Taylor TZ40's are used in the conventional Class B circuit and are fed by means of a 500 ohm line-to-grid transformer (Stancor) mounted in the center of the modulator-receiver chassis.

Facing the rear of the assembly on the left, we find the Class B output transformer which is a Stancor type A-3829 and is designed to feed push-pull TZ40's to the variable secondary RF load of from 3000 to 6500 ohms. This range will permit accurate match to be made to practically any single-ended triode. This transformer was chosen for its small physical size; and a heavy duty type of construction was necessary for trouble free performance.

A six-lug terminal strip was mounted by means of two angle brackets directly onto the mounting bolts of the transformer and leads were secured to the various secondary taps. In this way it is possible to change the tap position without resorting to the use of the soldering iron.

The special crystal microphone is a Shure Uniplex, which has been provided with a special push-to-talk switch (Mallory-Yaxley) for rapid break-in operation.

The two Taylor TZ40 modulator tubes are shown mounted in ceramic type sockets of the type used in the high voltage power supplies.

The input transformer (Stancor) is of the completely shielded type with leads passing down through holes provided in the chassis and thence to the mounting terminals which may be seen on the extreme right hand side of the shelf. The filament transformer mounts between this assembly and the input transformer.

Directly in back of the terminal assembly we mounted a Guardian change-over relay which is used in connection with the RME 69 receiver. The contacts of this relay are connected by means of cable to the switch furnished as part of the receiver, commercially termed a "Stand-by switch." Directly above the relay may be seen a 25 Watt mazda lamp used as a dropping resistor to the relay coil when it is operated on direct current. This lamp is also replaced with a 5 ampere fuse in the same manner as the control relays when the transmitter is being operated from the 110 volt AC series.

All of the relays used in the transmitter, with the exception of the under-load and over-load relays and the keying relay, are designed for 110 Volt AC operation and were supplied by Ward-Leonard. Inasmuch as the applied voltage required to close the relay varies with the type of current used, the above procedure is used to add the greatest possible flexibility to the system and also to furnish means of protection to the relay coils.

Directly in front of the modulator assembly may be seen the rear of the *RME 69* receiver. Enough room should be left between the receiver and the modulator parts so that connections may be made to the regulator receiver terminals.

The *RME 69* was chosen for its compact construction, high performance and ease with which it could be installed within the cabinet. The panel is supplied in a black ripple finish. In order to harmonize this panel with the rest of the equipment we chose to refinish all of the panels with readily available French Pearl Gray quick-drying lacquer.

If the painting procedure is carried out with care, the builder will find that the ripple effect will not be destroyed and in this connection it is well to caution the builder against applying the paint in thick coats. [Ed. note: Practically all of the regular amateur panels may be changed in color simply by applying thin coats of quick-drying lacquer with a soft brush.]

When installing the receiver it was found necessary to cut the right side of the channeling facing the front of the panel in order to provide clearance for the noise silencer unit which the manufacturers have made available to the purchasers of this receiver. This in no way upsets the performance of the unit as the panel overlaps this cutout. If the above precaution is observed, the entire receiver will slide in on the shelf with little effort and may be removed at any time for tube inspection or minor tuning adjustments.

The Radio News *VOX* System

Voice control of amateur and commercial transmitters has long been a dream of many a ham, and in the October issue of Radio News, 1939, page 33, will be found a complete description for the construction and operation of this very versatile gadget.

Briefly, the operation of the *VOX* is as follows: Assuming that the controls have been properly set and that time delay has been chosen for the particular style of the operator, action will take place in the following manner: The audio signal which is received from the 500 ohm line to the modulators is fed into the controlling tube within the *VOX* where it is amplified and fed into a gas discharge vacuum tube. From there it is fed to an amplifying 37 tube. Instead of this tube operating the speaker, the plate current flows through the relay coil, the resistance of which is selected for the normal current range of the plate circuit of the Type 37 tube. The discharge rate of the 885 tube which controls the grid and hence the plate current of the 37, is governed by means of the selector switch which either adds or subtracts resistance from the control circuit.

Either a fast or slow action may be chosen by means of the selector switch so that the relay will function for practically any time interval chosen by the user.

As the relay opens and closes it further controls the operation of the receiver and transmitter by becoming a substitute for the manual control and either method may be used to obtain the same result.

It is best to construct the *VOX* system as an independent unit on its own chassis where it may be thoroughly tested for operation before its installation into the cabinet. If good parts are used and care is exercised in its construction, it should require no further attention except for an occasional checking of its tubes. An over-all metal shield should be used to prevent stray R.F. pick-up. The *VOX* chassis is mounted by means of ¾" angle brackets to the left side of the cabinet when viewing the assembly from the rear. The two terminals shown on the rear of the metal chassis connect to the 500 ohm line while the other leads going to the *VOX* reley connect by means of cables and plugs to the front of the assembly where they will connect to the control circuits which are placed on the speaker panel.

THE SPEECH AMPLIFIER

In order to conserve on current wherever possible the writers chose to use a standard AC-DC type amplifier in place of the conventional AC pack. A study of the tube manual revealed that adequate output could be had from a pair of 25L6 tetrodes operating at around 100 volts on their plates. Furthermore, by using two type 25Z5 rectifiers with their filaments connected in series, it is possible to do away with the line dropping resistor which would otherwise be necessary in order to apply correct filament potentials to the various tubes.

The speech amplifier should be wired with care and all resistors (Aerovox) should be supported mechanically by means of terminal lugs strips so that vibration will not affect the mechanical efficiency of the completed unit.

The amplifier is built on a standard chassis (Bud) measuring 5" x 9" x 2½" and should also be provided with a metal shield to prevent any possible hum pickup. This unit is mounted in the same manner as the *VOX* system and is located on the right hand side of the chassis and may be seen by referring to the illustration. The amplifier, of course, should be thoroughly tested for quality and overall response before putting it in the cabinet.

CONTROLS

To make operation as easy as possible certain precautions should be observed in laying out and identifying the switches and other controls. To accomplish this, the writer mounted the toggle switches used in the alternating current section of the transmitter with large hex nuts, which are supplied with each switch, on the outside of the panel. Likewise, those used for DC operation are mounted in the reverse manner—that is, to use the ring nuts on the outside of the panel in place of the hex nuts.

The modulator power switch is provided

with a 2" dial plate which is painted with a green lacquer. The main control switch which places the transmitter in operation by applying the high voltage is also equipped with a similar dial plate painted with bright red lacquer. There is little likelihood that the operator would be confused in manipulating the switches if he will observe the above precautions.

The tone signal mentioned in earlier paragraphs is provided by means of a conventional high frequency buzzer. This unit may be seen mounted on the small control panel directly below the phone hand set. A dust cover should be provided to keep the buzzer reed free from dust. A suitable resistor is used in series with the buzzer to regulate the amplitude of the signal as it feeds into the *VOX* equipment and this control may be mounted permanently in back of the buzzer on an angle bracket, as once adjusted it needs no further attention.

Next month we will discuss the construction and the basic requirements in the design of the exciter unit of the transmitter-receiver. This unit is extremely flexible and considerable space will be allotted to its mechanical and electrical features. We shall also describe in detail the *Browning* band switching mechanism, the *Meissner Signal Shifter* and the associated circuits. While it is not essential that all of the features be utilized, there are many cases where an individual amateur or commercial operator may care to add any one particular unit within this transmitter. It has been the intention of the writers to construct these units individually so that should one care to incorporate one of these features in his own rig, he may do so on a smaller scale. —30—

Hamchatter

(*Continued from page* 26)

tures is the NO DUES. They have a 4-tube short wave receiver for 10-550 meters, and are planning the building of new equipment. *(Why not try that VTVM fm this issue? Ed.)*

WATCH the smoke at the Asheville, N. C., Hamfest on July 2nd. Promised is the fb'est time ever! Reservations are one buck each, and can be had from W4DPF, Box 128, Asheville, N. C. Advance registration closes June 30th.

The Glacier Park Hamfest will be held on July 15th & 16th at Avalanche Camp, near Spokane, Wash.

The ARRL NW Div. Convention will be held at Yakima, Wash., on August 25th, 26th & 27th.

W7GVN is wkg extra fb on vy low pwr; has QSL's fm 37 states, all VE's Alaska, Hawaii & Mexico.

Shame! What ham club seems to be decidedly pro-Nazi in its leanings?

W9YIT, St. Louis is installing a DeLux beam array consisting of a 4-element beam mounted on top of a 75 ft. telegraph pole. A special water-proof processing of the co-ax cable is used. The cable is laid in a trench from the pole to the shack. Also going up at W9YIT is a special ten meter beam which is being put up in the attic of the house. And what's more, YIT has just procured a duplicate 1 KW rig to the one described in *RN*, April, 1939 issue. Vy bst luck es vy vy fb!

W9ISX, op at WCFL, who has been ill since Xmas, is in Tucson, Ariz., recuperating. Get well sn OM!

ONE of the Seven Wonders of the world is how quickly the ham can be aroused to words, and how correspondingly slow to action. Eavesdropping on the one-sixty band the other pee-em we heard loud and raucous ructions from one end to the other on what was going to be done with 160 and 40M. None seemed to know what was exactly in the wind, but all were "agin it." Why not write your ARRL director and find out?

W9ETI had himself a fine fire the other ayem on the way to work. Ollie, who smokes like a chimney, threw his ciggie out of the window of the Chevvy, but the playful wind returned it onto the back cusheon. Result: FIRE! Since Ollie's insurance does not cover ciggie burns, he's thinking of going after the hole with a hot soldering iron and really collecting. If he does, we'll put the bee on him fer that double saw-buck we need for that other receiver gadget!

Sounds on the bands . . . "You're practically QRM'd, OM" . . . "r-r-r-r-r-*bk* ur sigs Q5R9 plus hr in Chicago. Wat sa OM? A short pause, then, "Sorri OM but QRM es QRN trrfc. Pse QRS es rpt each wrd 5 times" . . . "How do you get me now, OM? I'm modulating about 500%!" . . . "Can't understand the RI. I was only working on 2000 kc even!" . . . Yeah, I'll rebuild as soon as I can get the bank open" . . . "Yah say that the RI is over to your shack? Say, OM, tell that x%&$!*! so-and-so that I will break his %&¼½!:!* neck! Over!" A short pause, then, "Oh, you know the RI, and it's really him? Well, OM, I was only foolin'. *Nice to know yah, RI!* . . . "So I goes up to the president of our company and I tells him that I gotta get off a little early to fix the rig fer field day. It's fer the good of the country, I tells him. 'You're fired,' he tells me, 'and that's fer the good of the company.' Don't I have the darndest luck?" . . . "Well, the ole XYL got the bill fer that new thingamabob, and I've been in the doghouse ever since!" . . . "Sorri, 4KD but ur sigs verri super-bum hr tonite." A short pause, then, "Oh, it's *ON*4KD. Say are you pounding in here! Hardly able to get the receiver down to where you won't wake the baby!"

A meeting, held by the Southwestern Division at the Elk's Club May 9, was very well attended. All were pleased to meet K. B. Warner and hear his delightful talk. Vice President George W. Bailey, was also present, in his usual good humor.

Several of the other directors were also present, including Ben R. Adams, W6APU, R. H. G. Mathews, and Budlong, Warner's able assistant. Director Charlie Blalack reported the directors meeting just held in S. F. The meeting was presided over by W6KA who did his usual good job.

We are all glad to hear that Tom Nikirk, W6KA is back as chairman of the Federation of Radio Clubs.

Ralph Click, SCM of the Los Angeles Section has been doing some marvelous work in organizing the emergency groups of this section. The Federation of Radio Clubs, is also planning on co-operating with Click in furthering some of his plans.

K. V. R. Lansingh, and R. H. G. Mathews (4 letter initials!), had a chance to meet each other again while RHGM was in Los Angeles. This reminded many of the "old-timers" of the big rolling and snorting spark that Matty had at ole 9ZN, years ago, and the days when it was necessary for all amateurs to shut down in Chicago, when 9ZN opened up, so 9ZN courteously would then shut down so the other amateurs could open up (one at a time).

The RM Night, we note is an interesting way for the League Officials to get together and have a chance to meet each other. Regular operating on this night almost always includes: W6EY, J. L. McCargar, Director of the Pacific Division; W6GG, Charlie Blalack, Director of the Southwestern Division; as well as a goodly bunch of Headquarters Hams, including Don Mix, W1TS; Ev. L. Battey, W1UE, as well as the Headquarters Station W1AW.

THE Oregon Amateur Radio Association Convention, at Eugene, was a huge success with over 200 in attendance. 164 sat down at the banquet. "Speed" Horton, from Spokane, was very much in evidence.

The Officers of the OARA did fine. W7FQO, President; W7AHZ, Vice President; W7KL, Secretary; W7GQ, Treasurer.

It is an amazing thing to us how W7KL can keep that beaming smile of his going at top speed all the time that he is running meetings, typing fast code and conventions, and different things, all simultaneously.

W7ECQ did a good job with the convention photographs at Eugene, and the Hams enjoyed visiting W7BIK in his place of business around the corner.

The old CW Hound, W7FBA is finding more time to get on these days.

The Army Nets are getting thicker than ever, and the Net in Oregon will always find

W7BLN batting away.

W7GAE, and his 20 meter phone, makes quite a dent on the Pacific Coast.

W6USA has a "brainstorm" of a transmitter. Under a glass plate are twenty BLILEY Crystals controlled from a huge dial. As the dial is turned little lights indicate the frequency through different colored celluloid. Red is for Class "A" phone, green for unlimited phone, and white for "CW."

The twenty crystals in all, counting their usable harmonics, deliver sixty frequencies. Any frequency that is turned to is automatically picked up by a series of little motors, the proper antenna is turned on and the antenna tuned, as well as the transmitter tuned. If perchance someone should change the crystal, it will automatically tune itself to the new crystal. In other words, this transmitter is super-human, because it will tune the transmitter quicker and better in a half of a second than is possible for any Ham to tune it in an hour or more. It is all automatic, and the meters automatically tune it for the maximum output, and that, of course, is instantaneous, as these relays don't take long to slip in and out, and the motor follows instantly. [*Holy Gechosofat!* Ed.]

This particular transmitter works on four bands: 10, 20, 40, and 80, c. w. and phone.

In another booth, about 25 feet away is a series of 160 meter transmitters. Each booth has four top-notch receivers in it, so the visiting Ham can use any kind he wants. Any Ham producing his license is welcome to operate, and the men in charge, John J. Woerner, W6ONQ, and Robert C. Hansen, W6MPC, are doing a fine job.

W7ANV, the old Publicity Hound, is certainly to be credited with getting the gang out for the Eugene Convention.

It was amazing to watch Bill Riley, W7EXB, tooting away at his various instruments, entertaining the crowd at the banquet. He is a ver active amateur. For instance, he talked with VE5RV just two days before the convention opened on 75 meter phone.

One of the most interesting Code Contest Instructograph, typewriters and all, yet held was put on by Vic Watts, W7AQO, at the Osborn Hotel, at Eugene.

W7KV, Fighting Ralph Gibbons tells us that he will not be running for director next time. It is hoped that Ralph will change his mind, as he has made a very fine director, all these years.

Professor E. A. Yunker, changed his call from "7" to W6PHM. He is one of those responsible for the development of the "Rumbratron," at the Stanford University Experimental Laboratory.

W7FJZ had a great time with his portable during the several months he was staying at the Beach.

Big Sax, and Little Sax were very much in evidence at the OARA Convention. It is certainly a novelty to hear someone say, "There goes little Sax!" It reminds one of a sack of peanuts, or sugar, or such.

W7VS, the Ultra High Frequency Hound, had some new developments in the high power, ultra-high which he will be showing at the next convention, we hope.

W7DXF, the new SCM for Oregon, certainly knows his job.

It is good to hear that fine 75 meter phone of W7FCG, SCM Washington.

W7RT, now has more time to operate than he ever has since he was K7RT, in Alaska.

Gene Lovejoy has one of the keenest portables for the traveling man that we have yet seen. Gene even has antennas established permanently on the hotels that he stays at regularly.

W6AM Portable, on the Yacht Contender, will be on the air July 3 to 16, on the Honolulu Yacht Race. It would be well to pass the word along to all the 10 meter gang to keep a sharp lookout for his 450 watt signal.

W9ISR has a picture on the panel in front of his fone rig. It shows a desolate scene of a grave with a typical ham-shack in the background and bears this caption:

"Here lies the body of Johnny Ham
Ah woe unto poor little John;
He took hold of the plate coil
While he had his headfones on."

W9EDK is in Chicago attending classes at RCA. He sez he wants to get away from operating and get into the engineering end of the game.

W9HQH is experimenting with antennae again. He usually comes up with something good after one of those trances.

W9AZK usually has a lot of company (mostly YL's). 'S funny how bashful they are in the presence of a microphone until they get hold of the thing.

W9KRK lives at the junction of three street car lines, yet he manages to get in quite a few very nice QSO's. There's a lad who really has a noise level to contend with.

W9LXN sez he doesn't know who the new neighbor is. It seems when this fellow comes on the air 9LXN has to get off the air as his receiver is paralyzed.

W9ETQ has finally succumbed to the lure of 14 mc. dx. Howard has been a fixture on 75 meters so long he doesn't even like to tell about it. He has 500 watts to a pair of T 55s in the final and it sounds swell. Hope he decides to stick around.

W9AYN worked Milwaukee from Chicago on twenty meters at 2:00 a.m. That must be some kind of a record for ground wave dx.

W9VPQ is busy improving his fist these days. He has a nice job awaiting him whenever his fist meets the standard set up by the airways for their operators.

Incidentally a large number of us could stand improvement in that department.

Another pet peeve of ours is the fellow who insists on climbing into the fone bands with a punk c. w. signal. This type of band-hog can do plenty of damage to a fone sig. Of course there is no regulation to prevent a good c. w. sig in the fone band and there are reasons a plenty for us to preserve the privilege of operating c. w. on any part of any of our bands. But if this privilege is abused it will only be a matter of time until someone will come forward with a proposal to ban all c. w. from the fone bands. What's more, he will have a good case if we don't clean up this mess.

The fone boys can help by letting these fellows know just how much QRM is caused by this practice. A word to the wise is sufficient.

VE2EA came across with that pound of maple sugar. The package was covered with official documents, customs declarations, etc. The syrup we made went over in a big way but it was all gone before we thought to call for police protection.

Another kind of bootie is the fella who uses the call of a legitimate amateur with the amateur's knowledge and consent. The use of the word "Portable" in connection with bootlegging doesn't make this offense any less reprehensible.

The Chicago office of the *FCC* has been plenty QRL lately tracking down the not so elusive "Bootie." For a week the local newspapers have been full of accounts of trials and the methods used in running down the wise boys who thought they could get away with illicit ham operation.

W3EWN was visited by the stork who left a nine pound baby girl on Easter Sunday. This makes three for Jerry. He is now the proud poppa of two girls and one boy.

W5HDH of Alamo Gordo, New Mexico, was in town for a week having the medicos look him over. While he was here he was able to contact his son W5GGX in Albuquerque, N. M., directly using the rig at W9ISR on twenty meter fone.

The month of April brought some of the strangest radio conditions ever seen. On April 17 the twenty meter band went absolutely haywire. Many of the boys thinking their receiver was dead started right in tearing the things up. On the other hand, the day before, Sunday, conditions were unusually good. W4FBE held a solid QSO with Chicago lasting over two hours through the midafternoon QRM.

W6CHE and W6UF are still putting on their marvelous 1250 watt demonstration, into a dummy antenna from a transmitter which they carry around from place to place.

W6EJZ, the tireless president of the Bell

Radio Club, has time to go to other club meetings as well.

Some of the high scorers in the recent DX Test find that they will not be listed in QST because of Bad Notes. This is the first year that the FCC have really gone after the fellows for chirpy or bad notes.

W6OCH and W6ITH really didn't know who won the phone contest for the East Bay Section, but W6OCH finally won out.

W6MYO seems to monopolize GM2UU most every evening on 20 meter phone. W6MYO has one of the new Johnson "Q" beams on 20 meters which probably explains his sudden rise to fame.

W6NAT goes out on Saturday and Sunday with his 5 watt mobile, sits on top of a hill and works all over the United States, even though 10 meters is supposed to be dead.

Johnny Grigg, W6KW, in San Diego, has been working on a new transmitter for Fred Ferriera, XEMO. It is nearly done now, and a marvel to behold. It will certainly be turning signals out, as it carries the full 1000 watt rating. It is interesting to know, that in Mexico, an amateur can have any power he wants as long as he pays a certain license fee. Mr. Ferriera has taken out a 1000 watt permit.

W6FZD, who has 500 watts on 40 meters, is fixing up a marvelous 10 meter rig, using a 100 TL. Chances are that he will be even louder then.

K5AN, formerly of the Canal Zone, has moved over into Panama, so there is a chance for a new country.

W6DNS has some new theories of five meter propagation to spring as soon as he completes his present extensive investigation.

W6GG made several visits to Los Angeles recently, besides the main big meeting held at the Elk's Club.

W6FBW turns out to be a fine CW Hound on 80 meters.

Some of the boys are hearing VU2LK very fine in the morning on 20 meter phone.

The FCC announces that the new questions will go into effect for examinations, July 1.

W9DUU is out from Omaha, and is going to stay in Southern California, and will soon be a "W6" so we're glad to welcome F. E. Wilson.

W6DX, W6LA, and W6RI are all working out of West Coast FCC Offices.

Since the FCC secured a conviction of one of the notorious San Diego bootleggers, the air has cleared up greatly. It is rumored that extensive investigations are now being conducted in the vicinity of Southgate, Walnut Park, Bell, and Huntington Park.

Since the rule by the Federal Courts that "Radio Signals by their very nature are interstate in character, and therefore all stations must be licensed" leaves even the little 5 or 2½ meter bootlegger without a boot to stand on. Now that convictions carry a "felony" classification, it remains a permanent and irrevocable blot on the life record of the guilty one, besides the penalty of as high as $10,000 and two years imprisonment. Crime does not pay!

W6FEX can remember figures about forever. Just tell Wally the DX Scores, and a month or two later he will repeat them right down to the last figure, even though the fellows that gave them have to check back to see what they had told Fisherman Wally.

San Francisco has nabbed a bootlegger in fine style with all the evidence, thanks to the FCC and the co-operation of the amateurs.

KA3BW is visiting the U. S. A.

Lt. Christy Butterworth just pulled in with the fleet and is putting in for a "6" call. He is Ex W3ADO, W3ZZAB, XU3II, XU6II. XU8II, XU9II.

W6LI has his rotary beam just about done.

W6HU-W6AAF is back in the game. He once snagged some beautiful reports from the Yacht KFUH—"way back when."

ONE of the most rip snorting, bang-up Hamfests ever known to mankind (in other words the Hamfest to end all Hamfests) was held at the New Krueger Auditorium in Newark, N. J., Saturday Evening, April 22nd. With over 2,000 Hams, Ex-Hams, XYL'S, YL'S, and SWL'S present, the gang was truly representative of what it takes to make up *Ham Radio*. We certainly have to hand it to those UCARA Boys (Union County Amateur Radio Association) for putting on such a swell show. Every year they seem to get bigger and better, with more prizes, more fun, and more entertainment.

From Warren Whitford, the President, W2GNY, right down to the very last man of the committee on arrangements, W2KAL, goes the gratitude and thanks of all those attending, for such an enjoyable evening.

The *farthest away* prize went to H[illegible] here from Switzerland visiting United States Hams.

The multitude of prizes (they were stacked 3′ high on 2 tables, 6′ long and 3′ wide) were displayed on each side of the stage. They represented over $1,000 worth of Amateur parts and included 2 RME70 Receivers, 1 Sky Buddy, and 1 Hallicrafter 23, over $300 worth of transmitting tubes, 25 Weston Meters, 2 Atkins & Brown Transmitting Condensers and many more items too numerous to mention. Winning numbers were picked from a large cardboard box by 2AVA[illegible] XYL.

Displayed on the drop curtain, the ad of Mindlin & Kaplan, Painters and Decorators, gave everybody a good laugh.

Three bars of the Star Spangled Banner got the gang to their feet and the show was on.

THE Hillside Boys had a very attractive banner hung from the balcony inscribed with the call letters of W2LTE, W2KGI, W2AKT, W2LI, W2MCF, W2ZB, and W2LK.

A survey of the audience brought forth such prominent YL operators as W2JZ, W3FXZ, and W2JZX. Incidentally, W2JZ (XYL of Schooner Morrissey fame) was looking for a two-letter call for the new Junior Op.

Probably the best known of the YL Operators with reference to time on the air was W3FXZ (she operates all bands on CW, besides raising two Junior Ops.).

All ages from 14 to 65 were present.

W2GNY, the President, opened up the meeting after being assured that he could be heard by the South Jersey Gang who occupied the rear balcony. He thanked everybody for being present and assured them of a very enjoyable evening. He also gave great credit to W2CIS, the Secretary of the UCARA for all the detailed work which is so necessary to bring gatherings of this kind to a successful conclusion.

Anyone of you boys who have attended Hamfests of any size must realize what a terrific job it is, what with handling of publicity, correspondence, prizes, entertainment, and all the other hundreds of things that go into a big Hamfest. The president assured all of us that he realized everyone was present for social reasons only, and surely no one came with the thoughts of just being able to cop a handsome prize (hi!)

He thereupon introduced the Master of Ceremonies, one, Hank Shore, who "shore" did a swell job. Hank had the satisfaction of knowing that out of 2,000 men, women, children, and boys present, he was the only one possessing a very well groomed "Beaver." (See *Life*, April 24th Issue). He assured us that it was the McCoy and not merely stuck on with some copy paste.

His interesting discussion on "Television in Russia" was very enjoyable. Hank assured us that the Russians were considerably ahead of the Americans when it came to seeing a picture. His stories and satires on funny situations such as "How a Russian Prince would court an American XYL" were greatly enjoyed by the gang. The XYLS really went for the "Beaver."

THE next speaker on the program was Arthur Lynch of National Fame. He gave a very interesting talk on the problems and possibilities of the World's Fair Radio Association. There will be about 14 complete transmitters and receivers on duty 24 hours a day. He also described the problems arising in the use of High Power Amateur Gear due to the close proximity of the North Beach Airport. It seems as though it has become necessary to watch each piece of merchandise or electrical apparatus coming into the field to be sure that it is properly shielded against interference.

Arthur didn't look quite at home surrounded by 2 RME'S on the left and 2 Hallicrafters on the right. The gang got a big kick out of this.

Next in order was Captain Dave Talley, Signal Reserve Officer operating W2PFWLNA. His detailed talk on organizing traffic nets for handling messages originating at the World's Fair, gave the boys a short pre-view of what is to come. It seems as though they anticipate handling over 500 messages per day, a stupendous task even for an amateur. Requests were made for operators, and those interested were invited to write to the Communication Committee of the World's Fair Radio Corp., at 136 Liberty Street, New York, N. Y. A form letter will be sent to those interested so that qualifications, experience, and operating technique may be gone over before making appointments. The call of the Fair, of course, will be W2USA. Dave Talley is an old timer in the field and he has a very fine knack of getting his message home with the minimum amount of effort. The boys all appreciated his talk. More of this, later.

W7ALZ, of Washington, is taking a very active part in getting the Hams together in that area.

Now that the Hams have passed the 50,000 mark, there appears to be still an additional onrush. The Los Angeles office of the Federal Communications Commission has been giving about 25 to 30 amateur examinations per day for the last several weeks. However, Boys, Cheer up!—just about half of them fail, principally on the code, as the code test is really difficult these days, having numbers, punctuation and lots of straight English. The tape "bats" along at thirteen words a minute with no waiting and no delays. In this way the poor fellows can't make perfect copies.

We are glad to note that a number of new Alaskan Amateurs are starting up. W6USA works Alaskans easily through the noise level of the Exhibits at Treasure Island.

GM2UU hears W6USA just fine, over in Scotland, and is very anxious to communicate, and will doubtless have completed a QSO with them before this gets into your hands.

YE OLDE MAESTRO, Brother Hank, introduced W2JZX, Mrs. Viola Grossman, who made haste to explain that she had been pulled in and was totally unprepared to discuss emergency traffic handling due to shortness of time. She excused herself and turned the mike over to the president, W2GNY—All this at the UCARA hamfest!

Warren gave a short message from W2SN, the local QSL district manager, asking the boys to cooperate by sending stamps and envelopes to cover postage on QSL cards (GANG, TAKE NOTE—W2SN is a traffic cop. Better get the stamps in before he sends you a ticket over the air).

Probably the most interesting talk of the whole evening was given by a member of the *Weston Electrical Instrument Corp.* He described and operated an ultra high-frequency single generator, which, incidentally, makes a swell portable rig. It seems as though the gadget works on a principle of fixed capacity and variable inductance. Change of frequency is made by varying the inductance on the old principle of the variometer. This method insures great stability as it was actually possible to hit the oscillator quite heavy without any change of frequency being noticed in the receiver.

Winding up the program was a talk from our old friend Johnny Reinarts, WIQP now W3BIS, who is at present acting as consultant to the United States Navy on its radio problems. He assured us that the FCC was at all times active and quick to cooperate with amateurs and their problems. (Wonder if he knows about the 15-week wait to get a pass or fail on first examination?) It's always a pleasure to see and hear John at these Hamfests because of his well-known ability to give interesting talks. He's well liked by all the boys.

DOC WILBER, President of the *Delaware Valley Radio Association,* announced that the Third Annual Hamfest would be held on August 6th at the Trenton State Fair Grounds. Admission is $1.25 on advance sale, or $1.50 at the gate. He assured the boys of a good time and requested them to bring their YL's and XYL's.

W2AHL, one of the Baltimore Gang, announced a Hamfest to be held on May 13 at the Emerson Hotel in Baltimore. A 7 Course Dinner with milk fed chicken, prizes, etc., will prove to be a very fine attraction.

In between specialties, Theodore Mishart, with his piano accordion, really did a fine job.

All Hams present were requested to sign a petition addressed to the New Jersey State Department of Motor Vehicles asking for consideration with reference to securing plates with their call letters.

AT 10:45 a very enjoyable motion picture, "A Trip Through Radio Wonderland" by *Bud* Radio, was enjoyed.

Dancing with music by W2AGH and his Garden State Orchestra, completed a very enjoyable evening and the gang certainly extends their thanks to the UCARA Club for a swell time.

We'll all be there with our friends next year.

P. S.—As a parting shot W2GNY passes this bit of information along to the boys living out in the Sports District. "Don't shoot until it moves—it may be a WPA Worker."

THE calletters W8USA have been assigned to the Elmira Amateur Radio Assn. for operations at the 10th Annual National Soaring Meet in Elmira, N. Y., from June 24th through July 9th. Two transmitters will be in operation at W8USA. One with 300 watts input using all amateur bands 160 through 20, while the second will use 10 exclusively for communication between HQ on the field and the field sites. A special xmtr-rcvr will also be used for the gliders. It will be operated by a licensed amateur during flights, and will weigh only 14 lbs.

W3AOC is bedded in the hosp for an indefinite stay. Hpe he will be "with us" when this gets to your hands.

W3FNA got hisself a new rcvr es bug. W3FWF eeeeerected a new antenny. W3FC keeps trfc moving into Allentown es Bethlehem. W8RKZ wks fer WU. W3FSP, on twent', has antenna trouble. W3GKN is rebuilding his final. W3ECP has gone ECO. W3HBH is at CCC camp yclept Woolwine. W3GTS is rebuilding with a pr of 860 in par. Has 450 w.i.

W1BVR has been appointed Chief Radio Aide of the A.A.R.S.! Congrats, Percy!

3rd Corps Area Speed Contest held on Jan. 30, 1939, resulted in a win fer W3AKB; second, W3GBC; and third, W3EDC. Speed rate of the winnah, OM's, was 45 wpm! Sure vy fb!

Speakers at the Minneapolis Hamfest & Convention included: W9ZWW, W9JIE, W9CTW, W9BP, W9MZN, W1BDI, W9HCC, W9QEA, W9NNO, W9LIP, W9VKF, W9THL, and W9LFU.

The Milwaukee QSO party was a huge success. What happened there? Ask anyone who can remember! Nuff sed!

Well the ole USA calletters are getting too numerous to keep track of. Now we have W2USA at the World's Fair in NY, W6USA at S.F. Fair and W8USA in Elmira. What sa to a round table "USA" QSO?

W9LLX worka for Unca Sam instead of Newark Electric Co., Chicago, these days.

W9RGL may go to Conn. to visit his family. He says if it looks as good there as he has been imagining it, he will settle there fer a spell.

W2FDA has organized the *Eastern Engineering & Sales Co.* in Eastchester, Westchester, New York (Whew, what an address!). Will handle sound and television work together with custom installation, etc. What, no ham radio?

W9MEL is not on the air much these nights. Whatsa matter, feller? Has sprig, beutiful sprig got yah?

W9QEA plans a 50 watter in his XYL's car.

The lettering on the RADIO NEWS, *1940 All-Purpose Transmitter-Receiver* was done by W9ISR.

-30-

RADIO PHYSICS COURSE

(Continued from May issue)

Leaving, for the time being, the question of exactly what the structure of the radiated field actually is and how it is propagated, let us study several of its important characteristics which are definitely known as a result of experiment.

First, no matter whether we assume that the energy is propagated in the form of electrostatic forces by a wave motion, or by quanta of energy radiated from the vicinity of the transmitting apparatus, it follows from our study of electric fields that the radiated electric field which is in motion will produce an associated magnetic field which is at right angles to it at every instant. Since this magnetic field is produced by the electrostatic field, any variations in it will be in phase with those of the electrostatic field. Thus the total radiation field really consists of a moving electrostatic field of electric forces and an accompanying inseparable magnetic field caused by its motion. These are not to be confused with the *induction* electrostatic and magnetic fields discussed previously, they are entirely different and separate. Their form will be shown later in connection with an antenna with an earth connection in place of the lower wire in the doublet here considered. It can be shown mathematically that the strength of the total radiation field falls off *directly* as the distance from the transmitter is increased. Thus, at a point a very short distance from the transmitting antenna, the intensity of the induction field may be stronger than that of the radiation field, but at greater distances, the induction field is exceedingly small compared with the radiation field, and its effect may be neglected so far as ordinary radio reception is concerned.

Neglecting any absorption of energy by the earth, by tall buildings with grounded steel frameworks, etc., the *total energy* in the radiated wave remains constant. Hence as the wave advances, the energy spreads out over an ever widening sphere with the transmitting antenna as a center (assuming the antenna is not directional), and the *amplitude* of the variations in energy between the maximum and minimum during each cycle, decreases directly as the distance increases. The progressive decrease in amplitude of the radiated waves is somewhat analogous to the decrease in amplitude of water waves produced by throwing a stone in a body of water. As the wave disturbance spreads out in ever-widening cycles, the amplitude of each succeeding wave and crest diminishes, since the original energy imparted to the water by the stone is spreading out over a larger and larger area. At great distances from the antenna the electric wave disturbance would be similar.

(To be continued)

Short Wave Flashes

(Continued from page 42)

STRAITS-SETTLEMENT—R. Pybus of Manchester, England, writes that ZHP (9.2), Singapore, extends its schedule from 8:40 to 10:40 a.m. on the first Wednesday of each month to broadcast a carnival put on at that time.

SUNDAY ISLAND—According to the World DX Alliance, ZMEF (9.2) on Sunday Island in the Kermadec Group, may be heard contacting ZIL5, Wellington, New Zealand, irregularly from 1:45 to 2:15 a.m.

UNITED STATES—Come rain storm, flood or cyclone, *NBC* studios in Hollywood would still be able to tie in with the rest of the networks through a new short-wave transmitter recently installed. In event of an emergency, the short-wave outfit can be operated with a gasoline driven generator. South American reception of station W2XAD has been considerably improved by the use of a new antenna developed by Dr. E. F. W. Alexanderson of the *G. E. Company*. Known as the Alexanderson panel antenna, mounted on two 300-foot towers at South Schenectady, N. Y., the aerial decreased the vertical depth of the signal path, keeping it nearer the earth's surface and thus concentrating its energy. *NBC* has added a new aerial beamed on South America. Used in connection with stations W3XAL and W3XL, it increases the effective signal strength of these transmitters to an equivalent of 600,000 watts. Freighters on the Great Lakes are now using the following frequencies for communication purposes: 2.182, for messages involving life and property; 2.514, for ship to shore, and 2.738, for ship to ship.

U.S.S.R.—Radio-Center, Moscow, will no longer verify reports sent to any Soviet short-wave stations unless the language used on the program reported is one with which the listener is familiar.

VENEZUELA—YV5RC, "Radio Caracas," now operating on 5.04, has increased power to 5000 watts and is the best heard of any station operating on the 62-meter band. The interval signal for YV1RJ (4.97), Coro, is three strokes on a deep-toned gong. The Venezuelan station on 4.96, is announcing as YV5RQ, rather than YV5RS as shown in our official list of last issue.

Transmissions of Interest

Daily—9 a.m., news in English, over XGOY (11.9), Chungking, China; 12 noon, International Hour, over HP5G (11.78), Panama City, Panama; 12:30 p.m., news in English, over HP5G; 6 p.m., news in English, over XGOY (11.9), Chungking, China; 7 p.m., Radio Newspaper, over HP5G; 10 p.m., news in English, over TPB7 (11.885), Paris, France.

Sundays—(alternate Sundays), from 1 to 1:30 a.m., DX Concert, over TGWA (9.685), TGWB (6.49) and TGWC (2.32), Guatemala City, Guatemala; from 2 to 2:30 a.m., DX broadcast for International DX'ers Alliance, over TG2 (6.195), Guatemala City, Guatemala; 7:30 p.m., news in English, over HAT4 (9.125), Budapest, Hungary.

Mondays and Thursdays, from 9:05 to 9:35 p.m., English lessons for Spanish listeners, over W4XB (6.04) of Miami, Florida.

Tuesdays—from 4:45 to 5 p.m., Ted Roger's commentary on short-wave activities, over W2XJI (26.3), New York City, New York.

Wednesdays—from 4:30 to 4:45 p.m., "Camera Club of the Air," over W2XJI.

Saturdays—from 4:15 to 4:45 p.m., *Newark News Radio Club* program, over W2XJI.

Revised Schedules

ANGOLA—CR6AA (7.614 or 7.177), Lobito, broadcasts Mondays, Wednesdays and Saturdays, from 2:30 to 4:30 p.m.

BRAZIL—Desmond Callan of Readville, Mass., writes that PSH (10.22), operates weekdays from 6 to 7 p.m.; Mondays from 8 to 8:30 p.m.; Fridays from 7 to 7:30 p.m. and PSE (14.93), operates Wednesdays from 4 to 4:10 p.m. and Thursdays and Saturdays from 3 to 3:30 p.m.

CANADA—CHNX (6.132), Halifax, now operates weekdays from 7 a.m. to 11:15 p.m. and on Sundays from noon to 11:15 p.m.

D. R.—HIH (6.78), San Pedro, broadcasts from approximately 7 to 9:40 p.m. HI9B (6.39), Santiago, is at present operating nightly from 6 to 6:45 and from 8 to 8:45 p.m.

ENGLAND—Transmission I, from Daventry, is now broadcast daily from midnight to 2:15 a.m., over GSB (9.51), GSD (11.75), GSF (15.14), GSO (15.18) and GSI (15.26).

FRANCE—The French short-wave station is now operating as follows: to *North and Central America*, from 8:30 to 11 p.m., over TPA4 (11.718) and TPB7 (11.885); to *East and West Africa*, from 1 to 4 a.m., over TPB6 (15.13) and from 10:15 a.m. to 12:45 p.m., over TPB11 (7.28); to *West Africa* from 1 to 5:15 p.m., over TPB11 (7.28); to the *East and Far-East*, from 5 to 10 a.m., over TPA2 (15.243) and from 8:30 to 10 a.m., over TPB3 (17.85); to *South America*, from 6 to 8:15 p.m., over TPA4 (11.718) and TPB7 (11.885).

FRENCH INDO-CHINA—"Radio Boy-Landry" (6.21, 9.7 and 11.71), is now operating daily from 7:30 to 9:45 a.m.

JAPAN—The revised schedule of overseas broadcast from Tokyo is as follows: daily, from 1:30 to 2:30 a.m., over JZK (15.16); from 7 to 7:30 a.m., over JZK (or JZJ-11.8); from 8 to 9:30 a.m., over JLU3 (15.135), JZK (15.16) (or JZJ); from 2:30 to 4 p.m., over JZK and JLG3 (11.705); from 4:30 to 5:30 p.m., over JZL (17.785), JLT2 (9.645) (or JLG3), and from 8 to 8:30 p.m., over JZL.

SOUTH AFRICA—ZRO (9.752), Durban, now broadcasts daily except Sundays from 11:45 p.m. to 12:50 a.m., daily from 3:30 to 7:30 and from 9 a.m. to 12:30 p.m. and on Sundays, from 5:30 to 7, and 9 a.m. to 12:30 p.m. and over ZTD (6.1475), Durban, weekdays from 12:40 to 3:45 p.m. and on Sundays from 12:40 to 3:20 p.m.

TAHITI—FO8AA (7.1), Papeete, now operates on Saturday mornings only, from 12 midnight to 3:30 a.m.

UNITED STATES—W1XAL, Boston, now operates as follows: on 21.46, Sundays from 9 to 11 a.m.; on 11.79, weekdays except Saturdays, from 3 to 5:30 p.m., and on 6.04, Sundays from 1:30 to 6:30 p.m. and on weekdays from 6:45 to 8:30 p.m.; W1XAR, Boston, now operates as follows: on 15.13, Sundays, from 9 to 11 a.m.; weekdays except Saturdays from 3 to 5:30 p.m. and from 8:45 to 10 p.m., and on 11.73, Sundays from 1:30 to 6 p.m., weekdays except Saturdays, from 6:45 to 8:30 and from 8:45 to 10 p.m.

W2XAD, operates as follows: on 21.5, from 7 to 10 a.m.; on 15.33, from 10:15 a.m. to 5 p.m. and on 9.55, from 5:15 to 8:15 p.m.; W2XAF, operates daily from 3 to 11 p.m.; W2XE, New York City, N. Y., operates as follows: on 21.57, Mondays through Fridays, from 6:30 to 9 a.m.; on Saturdays, from 7 to 11 a.m. and on Sundays, from 7 to 10:30 a.m.; on 15.27, Mondays through Fridays, noon to 1:30 p.m., and Saturdays and Sundays from 11:30 a.m. to 1:30 p.m.; on 11.83, daily from 2 to 5 p.m. and on Mondays through Fridays from 5:30 to 9 p.m. and on Saturdays and Sundays from 5:30 to 10 p.m.; on 9.65, Mondays through Fridays, from 9:30 to 10:30 p.m. and on 6.17, Mondays through Fridays from 11 p.m. to midnight and on Saturdays and Sundays from 10:30 p.m. to midnight. W3XAL, New York City, N. Y., operates daily, on 17.78, from 8 to 5 p.m. and on 9.67, from 5 to midnight; W3XL, New York City, N. Y., operates daily, on 21.63, from 8 a.m. to 4 p.m.; on 17.78, from 4 to 9 p.m. and on 6.1, from 9 p.m. to midnight. W3XAU, Philadelphia, Pa., operates on 21.52, Mondays through Fridays, from 12:30 to 1:30 p.m. and on Saturdays and Sundays, from 12 noon to 1:30 p.m.; on 15.27, weekdays except Saturdays, from 10:45 to 11:45 a.m. and daily from 2 to 6 p.m.; on 9.59, Mondays and Thursdays, from 6:30 to 10:30 p.m. and on Saturdays from 6:30 to 9:45 p.m. and on 6.06, Sundays, Tuesdays, Wednesdays and Fridays, from 6:30 to 10 p.m.; on Mondays, Tuesdays and Thursdays, from 11 p.m. to midnight; Sundays, Wednesdays and Fridays, from 10:30 p.m. to midnight, and on Saturdays from 10 p.m. to 1 a.m. W4XB, (6.04), Miami, Florida, operates weekdays from 1 to 3 p.m.; daily from 9 p.m. to 2 a.m. and on Sundays from 4 to 6 p.m.

W6XBE, San Francisco, Calif., operates daily, on 15.33, 6:30 to 10 p.m. and on 9.53, from 7 a.m. to 10 a.m. W8XAL, Cincinnati, Ohio, operates on 6.04, Sundays, from 8 a.m. to 7:30, 11 to 11:30 p.m.; Mondays, from 5:45 a.m. to 12 midnight; Tuesdays, from 5:45 a.m. to 7:30 p.m. and from 11 p.m. to midnight; Wednesdays and Fridays, from 5:45 a.m. to 7:30 p.m. and from 11 to 11:30 p.m.; Thursdays, from 5:45 a.m. to midnight, and Saturdays, from 5:45 a.m. to 11 p.m. and daily except Saturdays from 1 to 2 p.m. W8XK, Pittsburgh, Pa., operates daily, on 21.54, from 5:30 to 8 a.m.; on 15.21, from 8 a.m. to 1 p.m.; on 11.87, from 1 to 10 p.m. and on 6.14, from 10 p.m. to midnight.

Frequency Changes

COSTA RICA—TIPG, San Jose, to 9.705.

CUBA—COBX to 9.21; COCM to 9.81 and COCQ, jumping around between 8.935 and 9 mcs.

HAITI—HH2S, Port-au-Prince, to 6.065; then to 5.95.

JAVA—PMH to 6.72; YDA, Batavia, to 7.25; YDB, Soerabaja, to 15.31; YDA2, Batavia, to 2.475; YDD2, Bandoeng, to 1.560; YDA6, Cheribon, to 2.335; YDA7, Pekalongan, to 2.4; YDE3, Semarang, to 1.520 and YDE4, Soerabaja, to 2.32.

NICARAGUA—YN3DG, Leon, now operates on 13.9 irregularly.

SOUTH AFRICA—ZRL, Klipheuvel, to 9.62.

STRAITS SETTLEMENT — ZHP to 9.7.

SUMATRA—YDX, Medan, to 7.22 and 4.945.

URUGUAY—CXA2, Montevideo, to 9.57.

Data

ALBANIA—ZAA, "Radio Tirana," Tirana, 3000 watts, operates on 7.85, weekdays from 6:30 to 7:30 a.m. and on Sundays from 6:30 to 8:30 a.m. and on 6.085, daily from noon to 1 p.m.; to 2 p.m. on Sundays.

AUSTRALIA—VLR, Melbourne, is now using QSL cards for verifications instead of letters.

CUBA—COBX (9.21), issues an attractive green, black and red, on white linen card. The address is given as Senor Alberto Alvarez, San Miguel 570, Havana. COCA (9.1), is now using the slogan "de los grandes Almacenes 'El Telar.'" COCW (6.33), is using the slogan "de los Almacenes de Panos 'La Borla.'"

D.R.—HI9B (6.39), "Broadcasting Hotel Mercedes," Santiago, issues a new QSL card with a photograph of the hotel on one side and station data on the reverse side.

DENMARK—OZF (9.52), verifies with a plain black on white card; also sends a diagram of its directional beams in projection. The address is given as Statsradiofonien, Heibergsgade 7, Copenhagen.

HOLLAND—PI1J, operated by Dr. M. Hellingman, Middelbare Technische School, Dordrecht, power 50 watts, operates Saturdays from 11:40 a.m. to 12:20 p.m. on 7.088, and from 12:30 to 1 p.m. on 14.164.

HUNGARY—HAT4 (9.125), Budapest, issues a large white card, with a green border, black print and red call letters. In the center is a miniature scenic photograph under which is the slogan "Justice for Hungary."

IRAQ—In addition to HNF (9.83) and YIJG (7.2), there is a 400 watt Baghdad transmitter on 6.7, which operates from 9:30 a.m. to 3 p.m. and an amateur transmitter on 14.2, which is in operation daily from 10 a.m. to 3 p.m.

IRELAND — "Radio EIRE" (9.595 or 17.84), is now operating frequently to as late as 6 p.m.

MADAGASCAR—Ashley Walcott of San Francisco, Calif., writes that "Radio Tananarive," Tananarive, is now operating simultaneously on 6.063 and 9.693, Sundays from 2:30 to 4 a.m., weekdays from 12:30 to 12:45, 3:30 to 4:30 a.m. (except Mondays), and 10 to 11 a.m.

MANCHOUKOU—JDY (9.925), broadcasts news in Japanese from 7 to 7:45, and in English from 7:45 to 8 a.m.

NEW CALEDONIA—FK8AA (6.122), is owned by Charles Gaveau of 44 rue de l'Alma, Noumea.

NORWAY—Frequencies and calls assigned to the new short-wave station at Oslo, are as follows: LKZ (21.503), LKY (21.467), LKX (17.78), LKW (17.75), LKV (15.17), LKU (11.83), LKQ (11.735), LKE (9.573), LKC (9.53), LKL (6.99) and LKJ

(6.13). Calls having other prefixes such as LLG (9.61) are of an experimental nature.

PANAMA—Famous English commentator George Williams has taken charge of program production for short-wave station HP5G (11.78) in Panama City. The International Hour heard daily from 12 noon to 1 p.m. and the Radio Newspaper heard from 7 to 7:30 p.m. are features especially prepared for English listeners.

PARAGUAY—Fred Smith of London, Ontario, Canada, reports a QSL card from ZP14 (11.721). "Radio Cultura," La Voz del Corazon de Sudamerica, Villa Rica, Paraguay. It is gray in color with the Spanish printing in blue.

PERU—J. E. Gardner of Cleveland, Ohio, has received information that "Radio Nacional Del Peru," with studios at Avenue Petit Thours 447, Lima, power 10,000 watts, operates at present as follows: over OAX4T (9.562), daily from 11:30 a.m. to 1:30 p.m. and over OAX4Z (6.082), daily from 7 p.m. to 1 a.m.

PHILIPPINES—According to a letter received from Al Naftaly, Studio Manager of KZIB (9.49), Manila, by H. Amers of Pomona, Calif., intensive improvements are being made at this station and a second transmitter will be added soon.

POLAND—Polskie Radio has informed John Evanovsky of Passaic, N. J., that SPD and SPW are merely provisory stations and will be withdrawn as soon as the more powerful transmitters are completed. SP31 and SP48 are intended for European reception.

PUERTO RICO—Fred Smith of London, Ont., Canada, writes that WKA2 (9.92), which he heard testing at 7:50 a.m., verified his report promptly with an unusual verification on oil paper. WKA2 is operated by the Puerto Rico Radio Corporation, P. O. Box 1414, San Juan, P. R.

SPAIN—Roger Legge of Binghamton, N. Y., writes that EA7BB (7.177), has verified with a postcard picture of Franco bearing a typewritten message on its back.

SWITZERLAND—The complete calls and frequencies assigned to the League of Nations station at Prangins are as follows: HBH (18.48), HBF (18.45), HBJ (14.535), HBO (11.402), HBL (9.345), HBL (9.595), HBP (7.797) and HBQ (6.675).

TRIPOLI—IQX (14.915), verified through the Italian Minister of Marine at Rome, according to Roy Waite of Ballston Spa, N. Y.

VENEZUELA—Most of the Venezuelan short-wave stations are already using their new officially assigned frequencies in the 62-meter band as shown in our last issue. However, some of the stations are deviating slightly from assigned frequencies; others are in the process of moving onto their new frequencies and a few are still operating on their old frequencies. Under these conditions it is natural that much confusion should prevail. It is believed that all Venezuelan stations will have changed to their new frequencies and settled down not later than July 1.

UNITED STATES—W4XB (6.04), Miami, Florida, power 5000 watts, is now issuing attractive pictorial QSL cards picturing Miami's skyline and Biscayne Bay at sunset.

Amateur Reception Notes

BAKER ISLAND—Baker Island may now be added to logs. KF6PUL (28.49), was contacted by W4EHH on March 24, at 6 p.m. and has subsequently been heard by many listeners between 5:30 and 6 p.m.

BRITISH GUIANA—VP3AA, operated by well known "Louie" Fonseca, is now going under the new call of VP3LF. VP3CO, a new station, is operated by Les Talbot, P. O. Box 241, Georgetown.

DUTCH BORNEO—Herbert Campbell of Athens, Pa., reports reception of PK5KF (14.04), on a recent Sunday morning near 10 a.m.

DUTCH NEW GUINEA—The new operator of PK6XX is ex-VK4HN of Papua. The A.R.R.L. is now issuing *Archbold Expedition Report Acknowledgement Certificates* to those listeners who sent in reports on reception of PK6XX. According to A.R.R.L. officials these can not be considered as verifications.

GREENLAND—Warren Stark of Wauwatosa, Wisconsin, reports reception of an NX2L, location announced as Etah, heard calling CQ at 7:20 p.m. Signals were so

loud Warren wonders if this station might not have been a phony?

LATVIA—Shokichi Yoshimura of Moji, Japan, reports receipt of a QSL card from YL2CD of Riga. It was a white card with lettering in red, picturing a view of YL2CD'S rig. A scenic postal card was also enclosed with the verification.

MADEIRA—Gail Beyer of Chicago, Illinois, reports receipt of an attractive red and blue QSL card from CT3AB just two months from the time his report was sent.

SUMATRA—PK4KS (14.32), heard from as early as 8 a.m. to as late as noon, has been logged by a number of listeners.

TANGIERS—The prefix of this country has been changed from CN to EK, thus CN1AF becomes EK1AF.

VENEZUELA—According to an air-mail letter from Walter Kammann of Caracas, YVAB8 (14.095), operated by Captain Cardona, with an expedition on the Caroni River, power 200 watts, is heard almost daily at 9:30 a.m. Reports can be sent to the Ministerio de Fomento, Caracas, Venezuela. YVAB9 (14.125), the transmitter of the GranSabana Expedition (mentioned in the May issue), is being heard daily at 6 p.m.

Last Minute Notes

GOLDEN GATE DX FESTIVAL—All dx-ers, amateurs and interested radio listeners are cordially invited to attend the first International DX Convention which is to be held in San Francisco, Calif., from July 8 to 11, in connection with the Golden Gate International Exposition. Elaborate plans have been made to provide every possible activity that might be of interest to radio enthusiasts. Some of these attractions were listed in our last issue. Those driving through are urged to load up their cars with other dx'ers or amateurs who might not have a way to go. Those planning to travel by train are invited to join the gang who will board the special DX'ers Train which leaving Chicago on July 2, will visit all points of interest enroute to San Francisco (contact the writer in care of RADIO NEWS, 608 So. Dearborn St., Chicago, Illinois, for further information). The outstanding feature of the Festival will be two world-wide dx broadcasts to be transmitted over General Electric's new 20,000 watt short-wave station W6XBE, direct from Treasure Island, on Tuesday, July 11, from 6:30 to 7 p.m. EST, on a frequency of 15.33 (directed to Latin-America), and on Wednesday, July 12, from 9 to 9:30 a.m. EST, on a frequency of 9.53 (directed to Asia). The Tuesday afternoon broadcast will also be carried by either NBC station KGO (790 kc.), or KPO (680 kc.). A most interesting feature of these broadcasts will be interviews with visiting radio listeners, amateurs, dx'ers and DX Club Executives. Those planning to attend the DX Festival should write or wire George Sholin of 55 Lapidge Street, San Francisco, Calif., to that effect immediately.

BERMUDA—Earl Roberts of Indianapolis, Indiana, writes that ZNS (6.09), the new station at Nassau, power 200 watts, relays broadcast station ZNS, daily from 1:30 to 2 and from 8 to 9 p.m. Address reports to the Director of Telecommunications, East Street, Nassau, Bahamas, B.W.I.

By JOHN D. CLARK

All times are Pacific Standard

Nippon

THE *Broadcasting Corporation of Japan* is now changing frequencies quite often in an attempt to find the most suitable wavelengths for transmission of the daily "Overseas Programs."

The 5 to 6:30 a.m. transmission is now carried by JLU3 (15.135 meg.) in addition to JZJ (11.8 meg.) and JZK (15.16 meg.). JZK is usually the best bet for western listeners. JLU3 and JZJ seem to be used alternately, although both have been heard simultaneously on some occasions.

JZL (17.78 meg.) no longer is on the air from 1:30 to 2:30 p.m., but still carries the 5 to 5:30 p.m. broadcast. It is believed, however that JZL will return for the earlier transmission in the near future.

JLT2 (9.645 meg.) has left the 11:30 a.m. to 1 p.m. program, and is now used only from 1:30 to 2:30 p.m. It is replaced on the noon transmission by JZK (15.16 meg.), working simultaneously with JLG3 (11.705 meg.). Both stations are heard in America with fair vol

JLG3 has also been used from time to in place of JLT2 from 1:30 to 2:30 p.m., is usually heard with better volume than 31 meter transmitter.

JZK will continue in use throughout the mer from 9:30 to 10:30 p.m. and from 4 4:30 a.m., although the latter broadcast sometimes carried through JZJ simultaneo

China

Station XGOX of Chungking, China, has its 15.19 meg. frequency and is now testing 17.8 meg. from 6:30 to 7:30 p.m. It is yet known whether this change will be perm nent, or whether the station will change to 15.19 meg.

A new station in Chungking has been ported on 6.00 meg. between 3 and 5 a.m. N in English is released at 3:45 a.m., but ide fication announcements are not given.

XOY of Chengtu, China, has been report by many listeners on approximately 9.37 m from 6:45 to 7:30 a.m. This does not seem be a daily transmission, but the broadcasts usually logged several times a week.

Indo-China

"Radio Saigon" has returned to the air af an absence of over a year. With a powerful transmitter, this station has returned to abbreviated wavelengths, and is now aud with excellent volume in all parts of the Pac Coast from 4 to approximately 6:15 a.m. dai Announcements are made in both French a Chinese. Occasionally English is also used identification purposes. "Radio Saigon" probably the strongest Asiatic broadcaster wh may be heard in America at the present ti Listen for it on approximately 6.13 meg.

"Radio Boy Landry," although eclipsed the powerful new "Radio Saigon" is still wo ing on about 6.20 meg., and may be heard da until 6:30 a.m.

Unidentified

A mysterious new station has been report on 11.82 meg. from 1:30 to 3 p.m. This broa caster employs a woman announcer during musical program from 2:30 to 3 o'clock. T language used has an Oriental tinge, but t station's identity remains unknown.

Another unidentified transmitter has b logged on approximately 6.08 or 6.09 meg. no 11:30 p.m. Saturday and irregularly on oth days. At 11:30 morning exercises are broadca followed by some Oriental music. The last minutes before midnight are usually occupi with organ music.

On approximately 11:85 meg. still anoth newcomer is reported near 4:15 a.m. with fi volume. Announcer speaks with an English a cent, indicating that the station must be locat in some portion of the British Empire.

An extremely powerful Nipponese transmit is working on about 7.30 meg., signing off wit out English announcement at about 6 a.m. Th may be JLG of Tokyo, although this is ve doubtful.

Still another new Oriental has been heard o 8.68 meg. near 5 a.m. irregularly. No an nouncements given.

Tuning Tips

Our listeners tell us . . . that PMD of B doeng, Java, is now audible with fair volu on 7.99 meg. near 4 a.m., although schedule only from 11 p.m. to midnight . . . that YS of El Salvador on 10.05 meg. is now heard w as late as 10:30 or 11 p.m. in all parts of t west coast . . . that VK6ME of Perth, Austral is now understandable only before 4 a.m. Aft that hour VUD2 heterodynes it badly . . . th VK2MA of Sydney, Australia is relaying pr grams from various Australian broadcast ha stations from 2 to 4 a.m. Sunday on approxi mately 6.72 meg. . . . that the July 1 spec broadcast from TGWA and TGWB, Guatema will be dedicated to west coast short wave lis teners and members of the Western World Wi Club. Listen on 6.49 and 9.68 meg. at 10 p. . . . that HS6PJ of Bankok, Siam, is again be ing on 15.23 meg. Monday morning from 5 to a.m. . . . that ZBW2 of Hongkong was hea on 6.09 meg. several mornings and then vanish . . . that VUM2 of Madras, India, is again aud ble with weak volume on 11.87 meg. (just unde TPA3) from 12:30 to 1 a.m. . . . that the ne broadcasts from Moscow's RAL (15.18 meg near 5:30 p.m.) are reaching the western part America with excellent volume . . . that GS of Copenhagen, Denmark, is reaching San Fra cisco from 7 to 8 p.m. on 9.52 meg., Cross down with bells, chimes, and the nation anthem.

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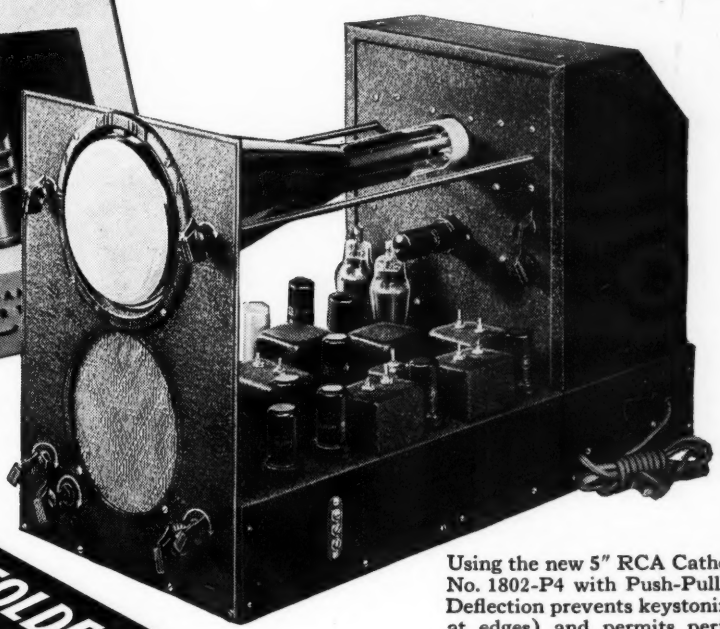

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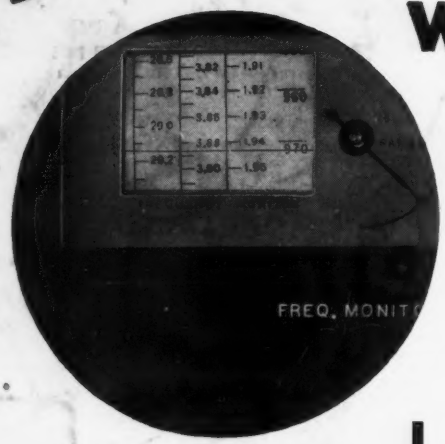

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